ACTA UNIVERSITATIS GOTHENBURGENSIS
GOTHENBURG STUDIES IN CONSERVATION 53

CRAFT SCIENCES

Tina Westerlund
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ABSTRACT

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The field of 'Craft Sciences' refers to research conducted across and within different craft subjects and academic contexts. This anthology aims to expose the breadth of topics, source material, methods, perspectives, and results that reside in this field, and to explore what unites the research in such diverse contexts as, for example, the arts, conservation, or vocational craft education. The common thread between each of the chapters in the present book is the augmented attention given to methods—the craft research methods—and to the relationship between the field of inquiry and the field of practice. A common feature is that practice plays an instrumental role in the research found within the chapters, and that the researchers in this publication are also practitioners. The authors are researchers but they are also potters, waiters, carpenters, gardeners, textile artists, boat builders, smiths, building conservators, painting restorers, furniture designers, illustrators, and media designers. The researchers contribute from different research fields, like craft education, meal sciences, and conservation crafts, and from particular craft subjects, like boat-building and weaving. The main contribution of this book is that it collects together a number of related case studies and presents a reflection on concepts, perspectives, and methods in the general fields of craft research from the point of view of craft practitioners. It adds to the existing academic discussion of crafts through its wider acknowledgement of craftsmanship and extends its borders and its discourse outside the arts and crafts context. This book provides a platform from which to develop context-appropriate research strategies and to associate with the Craft Sciences beyond the borders of faculties and disciplines.

THE CRAFT LABORATORY

This book is produced by the Craft Laboratory, a center at the University of Gothenburg. The Craft Laboratory was established in 2010 in cooperation with heritage organisations, craft enterprises and trade organisations, with the agenda to bring research into practice, and involve craftspeople in the processes of inquiry. The Craft Laboratory also provides the infrastructure for the University of Gothenburg's higher education and research in crafts located in Mariestad.

This book is published within Kriterium, a consortium that reviews Swedish scholar literature. This means that at least two external and independent experts have reviewed the manuscript and that Kriterium has subsequently approved the book for publication. Kriterium operates on the initiative of Swedish higher education institutions and aims to safeguard the position of the book as a format and strengthen its position in relation to other forms of scientific publication. All books published within Kriterium are available via www.kriterium.se.

PREFACE

Establishing a new discipline within the university is seldom a straightforward process. It involves multiple related actions and requires preparation over a lengthy period of time. Such an enterprise is usually part of a broader development stretching out across universities and countries, even if the process may be piecemeal and uneven.

This book is partly a result of the introduction in 2002 of craft as a university subject at the University of Gothenburg, Sweden. Still, more generally, it demonstrates a broad parallel move in this direction by many different partners in the Nordic countries. Today, all children of primary school level learn handicraft and sloyd and can pursue a career in many craft fields right up to doctorate level. This book attempts to introduce some of this development to an international audience.

The breadth and depth of the contributions to this book are, from my point of view, impressive. They show a field with a certain degree of maturity and independence that was difficult to imagine when I first became involved in the introduction of craft to the university more than twenty years ago.

And yet it seemed so evident that this was the way forward. Why shouldn't building and gardening craft be represented at the most advanced level of education? In 2000, two colleagues, Peter Sjömar and Gunnar Almevik, presented two short training programs in craft that had started just a few years before. These training programs were part of a lifelong learning policy funded by the state, but the ambitions were much more advanced from the outset. In the late 1990s, it had become apparent that the lack of highly skilled craftspeople in the heritage sector was a big problem. The market and private businesses could not solve the problem. Traditional learning from master craftspeople in small workshops was not enough to meet the demand, larger companies were rarely interested, and upskilling by labour market programs were too short-sighted. No institutions could meet the growing demand for in-depth craft skills and knowledge.

Sjömar and Almevik had a plan to address this deficit by building a long-term university education in heritage (conservation) related craft. It involved not only training and skills but also research and development activities, the production of new kinds of teaching material, and a focus on the specific theories underlying, supporting, and demonstrating the knowledge and skills necessary to perform high-quality craft. All of these aspects had already been demonstrated on a small but convincing scale on-site in the craft training programs in Mariestad.

At my first visit, it was clear that the project, however big a challenge, would be feasible given the proper support and resources.

At this time, around 2000, I was working at the National Heritage Board. With the support of my colleagues Sune Lindkvist and Marja-Leena Pilvesmaa, the agency addressed the Ministry of Education to encourage that the training programs in Mariestad be integrated into higher education.

In 2002, the University of Gothenburg, where I had recently been appointed professor, assessed whether the school in Mariestad could meet the criteria of a university program. After a two-day audit led by a professor in chemistry, Daniel Jagner, the assessment group concluded that all university standards were met. After a few years, new educational programs were introduced at the Department of Conservation. Senior lecturers were employed on their craft merits, and in 2007 the first PhD student with a craft background was admitted to the doctoral program. Fifteen years later, eight PhD students in conservation with a focus on craft as theory and practice have graduated from the department, and three professors with specialisation in craft have been employed. We can now say with confidence that a new discipline has been introduced and matured within our department.

There have been questions about, and criticism of, the decision to make craft a university-level discipline. Is there a need for carpenters and gardeners to be academics? Such questions can be answered in many ways. Here, it is enough to say that the decision was never meant to leave the masters of craftsmanship behind but to create formal and sustainable structures to support the continuation of this excellence—to develop complementary educational forms supported with pedagogical and economic capacity. However, we imagine the masters of the future to be different from those of the past. Alongside the deep material and procedural craft know-how of the trade itself, it will be essential to control generic management skills, to understand and decide on the specific criteria of quality in different fields (as in conservation), and to develop skills in new contexts through research.

One challenge has been developing appropriate formats of teaching and research which work alongside the shift in focus within the study of crafts away from the 'knowing-what' to the 'knowing-how', connecting to Gilbert Ryle's provocative concepts. Even if it were possible to gain approval of a craft curriculum, there is still a lack of procedures, assessment criteria, publications, and bibliometric standards to support the new direction. Today, craft education is represented from the lower levels of competence to the highest via the eight-grade European Qualification Framework (EQF). In many countries, the pursuit of a career in craft within higher education or beyond the common vocational training exit at EQF level 4 or 5 is uncommon.

Of course, the Swedish process does not exist in a vacuum. The United Kingdom brought polytechnical subjects, arts and crafts, and other creative practices into higher education in the early 1990s and introduced practice-led research discourses and formal practitioner doctorates. Finland established Craft Science around the same time and has by now generated hundreds of doctorates in crafts, many with a focus on craft pedagogy and teaching. What is particular to Swedish craft research and higher education is the perspective on craft in cultural heritage (or *kulturvård* [culture + care] which is the correct Swedish denomination) on the one hand, and on the other hand the involvement of large trade crafts and commercial craft fields beyond the artisanal crafts, like carpentry, masonry, gardening, landscape-related crafts, and culinary crafts.

The progression from the short training programs in Mariestad to the establishment of university-level education took just a few years. After this followed a more extended day-to-day effort to achieve and harvest what had been sown. So, this book, introducing parts of the Nordic perspective to a wider audience, is not only the result of the editors and authors themselves; it is *a collective effort* of all teachers and students struggling with a discipline in the making for over two decades.

Gothenburg March 29, 2022

Ola Wetterberg

CONTENT

Gunnar Almevik is a building conservator and professor in conservation at the University of Gothenburg. His research Cross the fields of cultural heritage, material culture and making, with a keen interest in methodology. He led vocational craft careers for carpenters, maisons and gardeners into higher education in Sweden, and established the Crafts Laboratory to bridge research and practice. Much of his research is cunducted in multi- and transdisciplinary collaboration and in real settings where practice is integrated in the research.

Camilla Groth is a practitioner-researcher and teacher with a traditional training in ceramic crafts. Her main research interests lie in haptic experiences and experiential knowing in creative practices, with a focus on material engagement and embodiment. She holds an Associate professor position in arts, design, and crafts at the Department of Visual and Performing Arts Education, University of South-Eastern Norway where she is leading the Embodied Making and Learning (EMAL) research group.

Tina Westerlund is a gardener and senior lecturer at the Department of Conservation, University of Gothenburg, Sweden. In her research, she focuses on communication of craft knowledge. She has specialised on this in relation to plant propagation practice, a knowledge needed both in garden management and in the preservation of plants of special interest. As a director of the Craft Laboratory, a national centre for craft in conservation, she works to build bridges between academia and cultural heritage institutions to support the development of knowledge exchange in the practice of crafts.

KEYWORDS: Craft research, craft sciences, practice-led research, practitioner-researcher.

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Explorations in Craft Sciences

By Gunnar Almevik, Camilla Groth and Tina Westerlund

INTRODUCTION

The field of 'Craft Sciences' refers to research conducted across and within different craft subjects and academic contexts. This book aims to build on the breadth of topics, source material, methods, perspectives, and results that reside in this field, and to explore what unites the research in such diverse contexts as, for example, the arts, conservation, or vocational craft education. The common thread between each of the chapters in the book is the augmented attention given to methods—the craft research methods—and to the relationship between the field of inquiry and the field of practice. A common feature is that practice plays an instrumental role in the research found within the chapters, and that the researchers in this publication are also practitioners. The authors are researchers but they are also potters, waiters, carpenters, gardeners, textile artists, boat builders, smiths, building conservators, painting restorers, furniture designers, illustrators, and media designers. They are in different career stages and have varied contextual backgrounds, but all have an academic education and are either doctoral candidates, Post doc researchers, university lecturers, or professors in their own field. The authors are mainly situated in a Scandinavian context and draw on very different research traditions such as the arts, educational and cultural sciences, meal sciences, and conservation, and from particular craft subjects, like boatbuilding, gardening, and weaving. With this we are aiming to broaden the field of educational craft sciences to include skilled manual work in materials also outside the definition of arts and crafts, but still not venturing into sports, music, or the medical context such as dentistry or surgery. While contributors in this anthology speak with voices that reflect their disciplinary diversity, we do not aim at defining or differentiating between arts, crafts, or design as we find these categories unhelpful, but rather think that these creative practices have more in common than what separates them.

Today there are several fields of study at universities in the Nordic countries which are strongly anchored in craft practice. Many of these traditional craft fields are housed in different disciplines or faculties and are hybridised within other academic subjects. We may, for example, find building crafts together with gardening and horticulture in the faculty of science; carpentry and upholstering in the faculty of technology; culinary crafts in the faculty of humanities and social sciences; craft education (*sloyd*) in the faculty of pedagogy; and most of the studio crafts, like jewellery, pottery, textile, forging, and cabinet making, in the art faculties. There are interesting combinations and hybrids with, for instance, heritage conservation, sensory studies, and design, but the craft elements of these areas of study are often in a comparatively weak position as they are subordinated to traditional academic disciplines and, in many cases, lack their own craft-focused research. Furthermore, a common feature in the Nordic countries is the strong divide between arts and sciences, which hustles the crafts—often considered peculiar to both artistic and scientific standards—to the margins. As an academic field, craft is entrapped both in old ontologies of what craft is, or is not, considered to be and the norms of established disciplines and subjects. There is a need for a dialogue and exchange over and beyond the borders of universities, faculties, and disciplines to consolidate a common platform for the Craft Sciences.

WHY DO WE CALL IT THE 'CRAFT SCIENCES'?

The word composition of 'craft' and 'science' may be perceived as an additive of crafts and traditional natural science, or a craft practice undertaken only as deductive hypothesis-driven research—but this is not the case. Craft Science had already been established as a field of study in the early 1990s by craft teacher educators in Finland in which the craft research was conducted in close relation to behavioural and educational sciences (Kokko et al. 2020). In this anthology we build on this tradition, relating to rigorous research conducted in craft practices of different kinds. The title of the anthology, *Craft Sciences*, is also connected to a translation from the established Nordic concept '*hantverksvetenskap*'—which in English could also mean craft-knowledge. However, in Swedish, the word *vetenskap* stands for both knowledge and science. In the Nordic languages in general, as also in German, *science* refers to the wider concept '*vetenskap*' or '*wissenchaft*', which does not have an exact translation in English. *Vetenskap* includes subjects within the humanities and social sciences such as the arts, music, sports, literature, anthropology, or history. The meaning of the word *Vetenskap* emphasises the rigour of an inquiry, scholarly attitude, and research expertise in any academic subject and by any approved method. In translation, we use the word *sciences* (in the plural) to point at the variety of possible research fields and subjects included. The combination of the words in an English publication, knowing the interpretation that readers do of the word *science*, is perhaps also a deliberate provocation to encourage the reader to think about craft in a way that may contradict habitual perceptions such as a hierarchical division between theory and practice. Additionally, when we speak about practitioners in this context, rather than using the word *craftsman*, we use the gender-neutral pronoun *craftspeople* to refer to makers in general, and *practitioner* and/or *researcher* to specify the different roles that the craftsperson may have. There exists a wide range of terminology associated with craft research, like practice-led research, practice research, and practitioner research, or cognitive associations like experiential knowledge, embodied knowledge, or knowledge in action. In this introduction we hope to disclose the origin or context of some of these concepts.

SHIFTING THE MEANING OF CRAFT

The Swedish word for *craft* is '*hantverk*', deriving from the stem 'hand' of the body, hence the word's strong association with manual work and handicrafts. This etymology is common throughout the Nordic languages, where craft is translated '*håndverk*' in Norwegian, '*håndværk*' in Danish, '*handverk*' in Icelandic, and '*käsityö*' (handwork) in Finnish, all with reference to manual work. In the longstanding discourse of the dualism of body and mind, craft was perceived as an opposite to scholarly work (Dormer 1997). Up until 2009, the official dictionary of Swedish language defined the word as "designation of certain kinds of work performed with the hands [...] to which (larger) technical skills are required, but in general little theoretical education" (SAOB). The perception of the activity has become an amalgam of the linguistic designation and entrapped in dichotomic formations, like theory and practice, intellectual and manual, official and worker, academic and vocational. When, in the late 1990s, five acknowledged craft schools in Sweden applied to the Higher Education Authority for the authority to be able to award academic qualifications, the ambition proved to be impossible (HSV 1997). Craft as a subject was not considered eligible for higher education at that time. Today, three of these craft schools are accredited institutions of higher education, but it remains the case that none has well-developed research as yet. This situation lies behind another motive in the creation of this anthology; namely, to encourage the establishing of craft education in the higher education sector and to inspire research activities in these institutions.

In a rather short period of time, the perception of craft and its cognitive boundaries has changed. The recent transformation is driven by various and mutually corroborative processes. Academic society has, in general, become more reflexive and critical towards unarticulated and biased ontological premises for scholarly work. For instance, there is now more awareness and understanding of how socially constructed notions of gender, race, and class may hinder or further ideas, careers, or positions over, say, merit and coherent reasoning. Furthermore, academic research in neuroscience, psychology, pedagogy, and anthropology has provided arguments for, and evidence of embodied cognition and the benefits of, incorporating experiential knowledge into research, too.

Cognitive science has during the last two decades shown that thinking is a fundamentally situated and contextually embedded activity that is dependent on a persons' active engagement with the environment through social and material interactions. This situated or embodied cognition is exemplified through the four E's: Cognition is Embodied, meaning that cognition involves the whole body, as when we make sense of a material through manipulation, for example. Further, cognition is Embedded, meaning it is embedded within structures in the social and material surrounding, such as in the craft studio or community of practice. Cognition is Extended, meaning that thinking is extended beyond the body of a person or organism, such as in tool use. It is also Enacted, meaning that what goes on in our minds shows in our actions, for example in skilled craft practice (Marchand 2012; Malafouris 2013; Newen, Gallagher and de Bruin 2018). These perspectives on cognition as dependent on action and thus also involving the body and sensory experiences, such as in skilled manual work, now have the potential to balance out hierarchies between theoretical and practical aspects of both work and education.

The shifting attitudes towards craft may also be related to the institutional change in European universities initiated by the Bologna agreement (for an overview, see Solberg 2017), to provide a general framework for qualifications and development of careers from undergraduate level to doctoral level. During the last two decades, Swedish universities have incorporated traditional vocations, like chefs and gardeners, into higher education, in which the students may proceed from bachelor through masters and doctoral education (Almevik 2019; Kokko et al. 2020). This process of academisation has many tangents and is not exclusive to the university. The virtues of scholarly work, with source criticism, evidence-based reasoning, and analytical and explorative methods, have influenced the whole education sector, right down to preschool. It has become more widely known that most careers and even traditional manual vocations require analytical skills, reflection, methods for documentation and assessment, and so forth. Today, the official dictionary for the Swedish language has changed the explanation of craft, now emphasising it as a "working method in production where the work is carried out on a small scale with technically simple aids and requires good professional skills [...] also about intellectual work by accepted methods (which can be learned)" (SAOB).

CRAFT RESEARCH

Theory of craft has been developed vigorously in the Anglo-American arts and crafts tradition (Pye 1995; McCullough 1996; Risatti 2009). There is also a vibrant research scene where crafts have been studied from a social science and art history perspective as well as from a philosophical perspective (Rolf 1991; Molander 1996; Dormer 1997; Adamson 2007; Risatti 2009; Sennett 2009; Marchand 2016; Kuijpers 2018). Craft is commonly defined as a vocational field, and craft theorists have been occupied with essence, meaning, definition, and history of craft, or traditional forms of knowledge transfer and skill acquisition. What is often missing is an understanding of craft as a field of inquiry and a research practice in its own right. So too is the voice and perspective of the practitioner that does not have presence when the craftsperson is the object of research.

One solution to this research gap has been for scholars of anthropology, history, or social science to spend years in a craft community, learning the trade through apprenticeship (Coy 1989) and thus being able to give an insider's account of how, for example, knowledge is passed down from master to apprentices and how interpersonal relationships evolve over time in a crafts community (Gowlland 2015; Marchand 2016; Smith 2016). As Marchand (2015) concludes in his article for the *Journal of Visual Anthropology*: "In order to optimize the 'productive' potential of such exchanges, the shift from 'studies of' ethnographic subjects toward collaborative 'studies with' communities of practice will become increasingly necessary" (2015, 321). Here, Marchand also acknowledges the benefits of audio-visual means to get even closer to the details of craftwork, including the voices of the craftspeople (ibid, 309). Gowlland, who has studied ceramic practices and practitioners in China (2015, 295), writes: "Apprenticeship as method represents a unique way of providing a first-hand account of experiences of work. One must of course be cautious about assuming that one's experiences of learning the craft are the same as one's informants." As seen in this quote, Gowlland points to the fact that the perspective of the ethnographer studying crafts through apprenticeship is still a different one from craft practitioners studying their own craft. In the process further on from there, the researcher's perspective has the potential to shift also from the "studies with" craftspeople to an "insider" perspective of craft knowledge through autoethnographic study of, for example, own skill acquisition (cf. O'Connor 2005; 2017).

In this anthology we have summoned research in which the craftsperson is not a mere informant, but author and researcher, thus giving the craftsperson a voice and simultaneously letting this voice be heard in the academic arena. Instead of having a mainly sociological or anthropological perspective, they have a longitudinal insider's perspective on their own processes with materials and creative practice. Some of them also have academic knowledge in conservation or archaeology, but have gained this additional perspective after acquiring craft skills and related knowledge. Practitioners with this type of overlapping knowledge may also be called T-shaped practitioners, as they are able to apply their deep domain specific knowledge in a broader interdisciplinary context (Barile et al. 2012). While being able to use craft processes as research inquiries per se, they also have the academic skills of drawing general conclusions of the results of their organised inquiry, for the benefit of the craft community and beyond.

Philosopher and craft theorist Bengt Molander has contributed to research strategies in this field, and he stresses the importance of craft research being functional to practice:

> Theories in craft reality must be practice-oriented—that is, they must be formulated in such a way that, as theories (principles, procedural descriptions, etc.), they can be understood and put to use in reality by skilled craftspeople.[1] This means theory that is able to help establish and maintain robust connections between craftspeople and what they work with and on, possibly in a multi-disciplinary setting. [...] Such theories must also function as orientation systems and thus be subject-oriented. An important part of the development of knowledge within the framework of craft science is also separating the purely subjective from that which is tenable and informative for everyone with (adequate) craft proficiency. (Molander in this anthology, and in original language Molander 2017, 30–31)

RESEARCH THROUGH PRACTICE

At present, there is a growing community of craft researchers who have embarked on practice-led research using research methods conducted *through* practice, developing knowledge from within the practice, exploring systematic ways to learn from practice, and aiming to bring back new content knowledge and functional approaches to improve their own fields and subjects. These practitioner-researchers study their craft for the purpose of learning more about their crafts but also to better be able to document it and to articulate it for others and to share their knowledge with the practice field and related education. Compared to a professional practitioner in production, who may not have the capability or competence to advance knowledge beyond personal enlightenment or improvement of the particular activity at hand, the added research training gives the practitioner-researcher skills and intrinsic motivations to pursue organised inquiry and to analyse the activity for the purposes of theory building, methodological development, and communication of the results to different audiences.

The contributions in the present anthology derive from a rather large range of contexts, disciplines, and subject matter, all with a different understanding of how to do and disseminate research that is formed in these separate fields. The one aspect that brings these authors together, and which led to them being invited to contribute to this book, is that they reflect on their own knowledge of a crafts-based practice and use this to their advantage in their research practice. We call them practitioner-researchers, and in the following we will briefly show some of the grayscaled points of departure for this kind of research in the creative practices.

Research through practice has gained traction especially in the art-based disciplines because inquiries through material manipulation and thinking through materials are paramount (Rust et al. 2007; Nimkulrat 2012). When it comes to the choices of methodology for research activities and their dissemination, the culture in this field is struggling to find a modality that is best suited to the nature of the practice while gaining credibility and respect in the academic context (Niedderer and Reilly 2010). Being a young field, research through the creative practices is still developing its traditions (Mäkelä and Nimkulrat 2018; Varto 2018) and the field is too dispersed to have settled on some agreement on how to conduct research through practice (Candy and Edmonds 2018). However, the reluctance of conforming to expectations keeps the field developing and the discourse on methods, motives, topics and forms of dissemination is a healthy influence on any research paradigm (cf. Borgdorff 2012; Sjömar 2017; Borgdorff et al. 2020). A phenomenological line of inquiry, through hermeneutical reflection between theory and practice, utilising self-study and autoethnographic data collection methods is common (Ehn 2011; Almevik, Jarefjäll and Samuelsson 2013; Ehn 2014; Jarefjäll 2016; Mäkelä and Nimkulrat 2018) and the research evolves through an explorative and reflective process in which the practice leads the way (Daichendt 2012; Candy and Edmonds 2018). Practice-led research is sometimes divided into a focus either on the conceptual process that is materialised in the artefact and, on the other hand, the study of practice through and for practice itself (Candy 2006; Wilson and van Ruiten 2013; or, for a more varied interpretation, Schwab and Borgdorff 2014).

Some of the authors in this anthology have used craft as a platform for artistic explorations into societal issues or values. They have expressed themselves in an alternative mode to academic writing, utilising an essayistic style. When getting insight into the creative practitioner's mind and lifeworld, the circumstances, values, pre-assumptions, and emotions governing the situations described, give insight into the different issues that affect the practitioner's decision making and motives. The academic article format of presenting methods and results is not as effective as the essay and reflective narrative in this context (Varto 2018, 60–61). Craft descriptions through case studies including self-reflection, work stories, production novellas, narrative life writing, or even fictitious storytelling can give precious insights and new perspectives for looking at the world and our society with new eyes (Livholts and Tamboukou 2015, 32–34; Varto 2018, 70–71).

Practice research as a sociological or anthropological study, connecting to material culture and heritage studies (Glassie 1999; Prown 2001; Planke 2001; Pink 2009) or practice theory (Lave and Wenger 1991; Nicolini, Gherardi and Yanow 2003; Strati 2003; 2007; Gunnarsson 2019), have tended to be a separate line of inquiry, but with much in common with creative research through practice. In practice research, the researcher is seeking to place the practice in a wider context including social patterns and interactions between the practitioner and others, material mediation and material culture (Gherardi 2000), as well as describing practitioners as members of communities of practices (Lave and Wenger 1991). The main focus lies in describing practice as situated, materially and socially mediated, and to study how practice-based knowledge is accumulating or transferred between individuals rather than explicating own practice-related knowing (Nicolini, Gherardi and Yanow 2003). The potential of the craft practitioner in this context is the deep understanding of the contexts studied and the empathic ability of placing oneself in the role of another craft practitioner, whether the act of crafting has happened in this lifetime or in a previous era. In research on skill and craft knowledge, the practitioner of a craft has code competence and embodied knowledge of the underlying circumstances for the successful or unsuccessful completion of a craft-related task and can thus inform historical research in craft from an insider's position. Combined with an academic education, and, as some of the authors of this anthology also have an additional education in conservation or archaeology, they are able to make sound and justified interpretations of crafted objects, tools, or descriptions of craft procedures from a time that has passed. The underlying assumption is that the informed practitioner is the best person to analyse the practice under investigation, as an outsider would not have the ability to detect patterns of importance to that practice or related processes.

The cases presented in this anthology are diverse but take a similar approach in the way they involve the craft practice and practitioners in the research, as these practitioner-researchers are connoisseurs in their particular fields. Examples are given to coherent research approaches in historical studies and contemporary studies, as well as creative research designs for the future. These involve methods for observation, participant observation, and self-observation. Many times, the researchers alternate between participating in and observing the practice in a process of zooming in and zooming out (Nicolini 2009). A particular methodological challenge that recurs in all of these cases is the critical position of being both a research subject and a practitioner or connoisseur in the field defined as the object of research.

The field of practice-led research has suffered from low credibility in some areas of research (Niedderer and Reilly 2010; Campbell 2013) due to the difficulty in employing so-called rigorous research methods. Self-study oriented research projects are easily criticised for a lack of objectivity and poor credibility as the researcher is analysing data that is produced by the researchers' practice—i.e., the data could be manipulated to show desired results. It has been suggested that the data should be co-analysed together with a second researcher to add a more distant view on the subject under study (Geiger, Muir and Lamb 2016). In research on experiential knowledge of a specific type of practice, it may be challenging to find another researcher with the same understanding of that practice, in particular when the research concerns an unusual craft practice. Consequently, we here argue for subjectivity and intersubjectivity as vital concepts in the analogy at hand, as an insider's perspective is not possible through objective and distant approaches. However, some of the methods employed by researchers in this book are adapted from more rigorous research settings in other fields in an attempt to make the processes more organised and transparent.

NORDIC CRAFT RESEARCH IN DIFFERENT ACADEMIC TRADITIONS

In Sweden and neighbouring Nordic countries, craft research has long-standing but various academic traditions that stem from different roots. Craft has been a frequent object of research in the cultural sciences, from empirical folklore studies in the early 1900s to contemporary critical heritage studies. Within the humanities, it is common that an academic study of an art or craft is separated from the practice and delimits to theoretical, historical, and critical approaches. In addition, architecture and engineering have investigated crafts in subordinated fields, like historic preservation, building conservation, and the history of architecture and engineering. In all of these fields, the craft has mainly been an *object* of study and the craftspeople, if acknowledged, have been approached as oral sources.

Another direction of research involves the practices. In medicine, for instance, the traditional craft of surgery has been incorporated and developed within the discipline of medicine. A radical event in the modern history of the higher education sector was the establishment of science in nursing and physiotherapy in the 1980s, which initiated an active search for theories and methods for research in professional practices (Josefson 1988). In these practice fields the material context is not in the centre; instead, the craft of dealing with personal relationships and human situations form the context of research. Here, grounded theory and action research became dominant approaches and with emphasis on reflexivity and dialogue to manage subjectivity and rigour in qualitative research. Theories were frequently borrowed from philosophy with particular interest in the pragmatist tradition (e.g. Dewey [1934] 2005; Schön 1983). The Swedish Institute for Work Life played a main role, accompanied by influencers like Bernt Gustavsson (1991; 2004), Bo Göranzon (1990), Ingela Josefson (1988; 1991), Bengt Molander (1996), and Bertil Rolf (1991). These references are still active and Ingela Josefson's concept of *förtrogenhet* (familiarity or connoisseurship) and Bengt Molander's outline of *knowing in action* have become elements of a general epistemology for practice-led research. The legacy is also present in research and education at the Centre for Studies in Practical Knowledge at Södertörn University and a corresponding centre at Nord University in Bodö evolving out of different forms of practical knowledge particularly in working life.

Characteristic for the Nordic countries is the early established craft (*sloyd*) teacher's education (education for teachers of craft in the K-12 primary school sector) and the emerging craft research in relation to craft teacher education in this context. The vocational sloyd seminars were integrated into higher education in the early 1970s and provided doctoral careers from the 1990s. About twenty dissertations have been presented in Sweden centring around conversation analysis and ethnomethodological approaches to acquisition and transfer of craft skills (e.g., Johansson 2002; Hasselskog 2010). In Sweden, *slöjdvetenskap* or 'science in sloyd' was formalised through Marléne Johansson's professor chair in 2014 at the University of Gothenburg. In Finland, *käsityötiede* or 'craft science' had already been established at Helsinki University in textile studies in 1992, and is now the formal discipline at all departments of sloyd teacher's education. Pirita Seitamaa-Hakkarainen is one strong predecessor who has long encouraged rigorous craft research, basing much theory in design cognition and behavioural studies (cf. Seitamaa-Hakkarainen and Hakkarainen, 2001; Seitamaa-Hakkarainen et al., 2016). Many Nordic craft teachers and sloyd researchers are affiliated with the NordFo organisation (*Nordiskt forum för forskning och utvecklingsarbete inom utbildning i slöjd*) which provides recurrent conferences and which also stands behind *Techne Journal*, based in Finland. The sloyd and craft teachers' research, as well as art and design research, is also visible in the Norwegian *FormAkademisk Journal*.

The art schools in Sweden were provided with doctoral programs in the early 2000s, as initiated by the Bologna process. The first doctorates defended their dissertations in 2006, and the first dissertation dedicated solely to craft as a subject in its own right was defended within an art faculty at the University of Gothenburg in 2016 by ceramic artist and researcher Mårten Medbo (2016). Aalto University in Helsinki has a longer history of guiding doctoral research in the fields of art, craft and design, now with over 100 graduates since the early 1990s. Many of these employ practice-led research methods, some of which have been developed by the school's pioneer in artistic research practices, ceramic artist and researcher Maarit Mäkelä (see, for example, Mäkelä and Routarinne 2006). The *Embodied Making and Learning Research Group* (EMAL) at the University of Southeast Norway is made up of 35 researchers, organised in clusters dealing with different aspects of crafts research. The institution represents the largest collective of craft researchers in Norway and their research activities in arts and crafts education span over decades and form some of the basis for evidence-based education in Norway. Despite these thorough achievements and strong Nordic research environments, researchers who do not write in the English language easily fall under the radar of the international craft research audience. By writing a Nordic craft research anthology in the English language, we build on this tradition and point to some of the similar work that takes place in this Nordic region.

CRAFT AND CONSERVATION

The origin of this anthology stems from yet another root, involving crafts in conservation. Conservation is a poor translation from the Swedish denomination for the academic subject *Kulturvård*, that would be, word by word, *culture + care*. To care for culture. *Kulturvård* is established at two Swedish universities in Uppsala and Gothenburg, involving research, higher education, and professional development, where Craft Science constitutes one dominant field alongside integrated conservation of built environments and the more heritage science profiled conservation of cultural property. All these fields overlap in the applications of the Craft Laboratory in Mariestad, with research and curriculums in building crafts, gardening or horticultural crafts, and landscape preservation. Craft research in conservation employs a variety of theories and methods that deal with different temporalities, from the study of history and the examination of present materials and practices to the forecast, design, or making of heritage futures. Conservation is transdisciplinary and familiar to multi methodological approaches, bridging research perspectives between natural, cultural, and social sciences (see, e.g., Jarefjäll 2016; Westerlund 2017; Seiler 2018; Eriksson 2019; Källbom, Nilsen and Örström 2019).

Kulturvård is a small and uncommon academic subject but with a great mission. In practice, *kulturvård* is commonly associated with the category we name cultural heritage. Heritage is a category of phenomena that are made and used in society, and, as such, are often defined as valuable, unique, fragile, and worthy of safeguarding. Research shows that the heritagisation processes may strengthen communities and groups in taking ownership and finding strategies to safeguard their heritage (Smith and Akagawa 2009; Niedderer and Townsend 2015; Almevik 2016; Almevik and Melin 2016), but also the fact that authoritative and dissonant heritage discourses of nationality and sovereignty, for instance, are used to oppress communities and groups (Smith 2006; Holtorft and Troels Myrup 2015; Hafstein 2018). However, *kulturvård* is not just about heritage. The subject comprises knowledge and skills focused on the challenges of bringing resources from the past—tangible and intangible—into present and future sustainable use (Almevik and Gustafsson 2021). It has been referred to as a management of change, or a problem-oriented activity devoted to preserving natural, cultural, and social resources in a process of change. It's an academic subject about traditional knowledge and circular economy, about mending, repair, and maintenance, based on deep material knowledge, cultural understanding, and crafts. In this regard, this anthology touches the core of *kulturvård*.

THEMES PRESENTED IN THE ANTHOLOGY

The book is structured using seven themes that group the chapters according to different approaches of craft research. The theme *Multimodal Communication* highlights some issues posed by the expected format of the academic output—that is, the usual article templates. In the chapter "Rethinking the Academic Artefacts," Gunnar Almevik and Jonathan Westin review and analyse examples of multimodality in practice-led research outputs with the objective of pointing out and discussing the strengths and weaknesses of different media and formats of dissemination. The text undertakes an epistemological perspective on the restrictions related to contemporary academic artefacts, such as in the article formats, with the aim of eliciting paths to create, and advocate acceptance for, more relevant academic artefacts—that is, forms of dissemination for craft research. In the chapter "Video as a Tool for Knowing and Telling in Practice-led Craft Research" by Camilla Groth, this discussion is taken further as the author points to the limitations of the written word in communicating the more experiential aspects of the research that are important in the specific research context, such as the physical actions and movements of the practitioner and their sensory perceptions, both of which may convey important information. The text-based academic artefact is thus challenged, and alternative forms of media, such as audio-visual links in articles or three-dimensional object files, are argued for instead. In this vein, Ulrik Hjort-Lassen also uses video in his attempts to convey his timber-framing craft skills to the next generation through the development of learning resources, as presented in the chapter "Making Instructions: Developing Learning Resources in the Craft of Timber Framing."

In the second theme, *Science in Crafts*, three chapters describe the use of existing scientific research methods that are modified for the purpose of craft research. While research through craft practices are new in the academic field, new methodologies that take the nature of the practice into account need to be developed. Often, sensory evaluations of materials or situations are highlighted in this context, which makes the researcher's own longitudinal craft experience a necessary part of the analysis. Arja Källbom's chapter, "Using Profiling Methods to Develop the Sensory Vocabulary of Architectural Painters Who Use Linseed Oils," shows that subjective evaluations are necessary in craft research, but that their credibility may be asserted by group evaluations or the use of systematic approaches, such as the Repertory Grid Method. Similarly, Lars Eriksson writes in his chapter, "The Waiter's Craft Knowledge of Meal-design," about how visualisations through Time Geography help him to research his practice using rigorous methods from the field of Human Geography. The third chapter in this theme, "Exploring Folk Art in Historical Interiors" by Ingalill Nyström, Anneli Palmsköld, and Johan Knutsson, explores the Art Technological Source Research method. These methods are borrowed from other contexts and modified to suit the practices under study here. By supplementing research through human actions with a structured research setting, rigour is added to both data collection and analysis.

The third theme is about *Craft Reconstructions*. Reconstruction places the researcher closer to a situated understanding of the prerequisites of the artefact under study and may facilitate an embodied understanding of previous craft practices. Even in cases where craft knowledge is lost, the methodologies developed in the following two chapters may inspire researchers to look further than historical texts for answers to their research questions. The chapter "Notations on Craft: Movement, Gesture and Bodily Expression," by Harald Bentz Høgseth and Magnús Rannver Rafnsson, explores reconstruction through the craftsperson's gestures and makes the case for developing a notation system based on the movements of the practitioner, which has the potential to both store and disseminate craft knowledge. Joakim Seiler is also describing his reconstruction processes in the chapter "Gardening Craft Reconstruction," showing how he rediscovered lost, intangible craft knowledge through his embodied knowledge which became accessible through the reconstruction of a craft situation.

As already discussed, the longitudinal craft experience of the researcher is necessary in the analysis of sensory evaluations and judgements. This is highlighted again as we see how historical actions may be traced in the artefacts under study. In this fourth theme of *Craft Interpretations*, the chapters display the value of the practitioner-researcher's knowledge and experience of craft practice in multidisciplinary contexts and in relation to education. In the chapter "Traces of a Textile Tradition," Annelie Holmberg is using her own craft knowledge to interpret the different types of textile manufacture and how the traditions have changed over time. Fredrik Leijonhufvud, in the chapter "Interpretation of Boats in a Craft Tradition," is trying out different methods of documenting old clinker boats through which he is decoding craft knowledge. In this process he is using his own experience of building traditional wooden boats. Similarly, ceramist and archaeologist Katarina Botwid is utilising her specific knowledge about ceramic crafts in her interpretation of archaeological findings in the chapter "Craft Knowledge in the Service of Archaeology."

Craft research takes place in many different domains and contexts. The fifth theme, *Making as Research*, explores notions of artistic research through craft. Here, the act of making is, in some respects, a research process in itself. By forming material, we may form research questions that are answered only in the unfolding of a material processing of thoughts and tests. In the following three chapters, the idea of a making process as a way of communicating and understanding others is made visible. Anna Lovisa Holmquist's chapter, "The Production Novella as a Textual and Visual Narrative Method in Craft-based Design," visualises and communicates the atmosphere of the deteriorating small-scale factory environment through both images and words, raising questions of the borders between manual and production-based craft practices. In Birgitta Nordström and Camilla Groth's chapter, "The Role of the Weaver in the Encounter with Life and Death," craft practices are used as a means for engaging with and communicating difficult issues between people and as a way to soften the culture of meeting death. Meanings inherent in and through both craft objects and the craft practice itself are vented in the chapter "On Wheel-throwing and Meaning," by Mårten Medbo.

In the sixth theme on *Re-classification*, the authors discuss classification as a tool in the personal, group, and educational sense-making process of craft practices. Essentially, it may be both a clarification and a communication tool. In the chapter "Understanding through Blacksmithing Techniques," Gustav Thane is attempting to classify verbs used in the practice of blacksmithing in order to analyse the actions within his practice. In the chapter "Classification of Plant Propagation Practice," Tina Westerlund presents her classification system for gathering documented knowledge on plants' propagation for the purpose of a systematic knowledge communication and dissemination.

The last chapter in the book is an epilogue and reflection by philosopher Bengt Molander on the concept of theory as an idea, a term, and rhetoric.[2] Theory is an ambiguous concept with different meanings and uses in scholarly society. Molander seeks to enable a concept of craft theory that is essentially developed through craft practice and studies of craft practice emanating from this practice itself.

FINAL NOTES

By gathering contributions from craft researchers in an anthology, we contribute to promoting craft as a subject for higher education and research in its own right. However, as may be seen from this introduction, crafting and making practices are ubiquitous and exist everywhere where human, artificial, and material culture takes place. The study of own knowledge in relation to practice is not uncomplicated and often requires developing a method for enquiry before setting out. An overall impression of the research presented in this anthology is that practice fields may benefit from academic research but they still need to keep the practice alive in this process. By studying crafts through practice, the practice avoids being turned into lifeless data and is kept alive, but this has to be reflected all through the process, through a methodology that facilitates data documentation and analysis that doesn't change the modalities of the data too far away from the original (see also Eriksson et al. 2019). This means that the academic artefacts or dissemination form should ideally reflect the processes, materials, and modalities that are under study. Improvements in traditional publishing are under way through the inclusion of audio-visual formats in online publications. Similar evaluations of craft research should ideally take into account the artefacts and the processes dealt with in formats that are as accurate as possible in educational contexts. Here, the traditions in the field of artistic research have led the way forward. In the same way, craft research may benefit from methodological advances in other traditional sciences. The craft researchers presented here have borrowed and developed methodologies like time-geography, ethnomethodology, conversation analysis, and autoethnography. In addition, critical and reflexive approaches from traditional sciences add to the rigour of subjective evaluations and aid categorical studies and the generalisation and accumulation of research results. While the anthology presents various methods and contexts for craft research, the one thing that they all have in common is the benefit of a longitudinal personal experience as a craft practitioner in the particular craft field under study. This points to the advantages that the craft practitioner has in the research field and to the necessity of opening up the possibilities for practitioners to conduct academic research in their own practice field. While being experts in their own domain, the academic practitioner-researcher has an education that spans both the craft practice and the practice of research, making them ideal collaborators for transdisciplinary research.

The main contribution of this book is the case collection and the reflection on methods developed in the search for the best way to capture the fleeing experiential knowledge of the practitioners. Additionally, it gives a voice to the practitioner in the general field of craft research. The anthology also adds to the developments presented above through its wider acknowledgement of craftsmanship that extends the borders of craft theory and its discourse beyond the arts and crafts. The anthology thus also aims to provide a platform for developing context-appropriate research strategies and associating with the Craft Sciences beyond the borders of faculties and disciplines. Through concrete examples of methodological developments that are custom made for the particularities of human-material interactions and the living nature of practical work, it offers inspiration for practitioners and researchers in various contexts. Due to this approach it may contribute to new knowledge in research methodology, philosophy of science, pedagogy, and organisational studies, but also in closely related fields such as conservation, cultural sciences, and art and design. As research conducted by practitioner-researchers is gaining traction internationally, too, we anticipate that the readers will be an international crowd of researchers and educators in both academic and vocational craft contexts who are especially interested in the methods developed here and the general discussion on experiential knowledge and the dissemination of such knowledge. Additionally, we hope that this anthology could lift the Nordic craft research tradition into the international arena where it has not yet earned too much attention. The Nordic countries have traditionally contributed to this field of research in their respective local languages and are relatively unknown at an international level, despite having a solid development in this area. Ultimately, we hope that the anthology will form a resource for researchers but also for students and teachers in all cycles of higher education within crafts and craft related domains, nationally and internationally.

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ENDNOTES

1. Bengt Molanders's note: Cf. Polanyi's term "maxim," a rule that only those that are already skilled can follow (Polanyi 1978, 30–31). Cf. also Winch (2010) about "knowing how something is done" being one thing and skilled execution another.

2. Bengt Molanders text is appended to the anthology and has not undergone the peer-review process by Kriterium. The text has been published previously in Swedish, with the title "Tankens frihet och längtan efter verklighet. Om »teori« som idé, begrepp och retorik", in the anthology *Hantverksvetenskap*, edited by Gunnar Almevik and published by The Craft Laboratory, University of Gothenburg. The text has been translated by Katherine Stuart.

MULTIMODAL COMMUNICATION

MULTIMODAL COMMUNICATION

The theme Multimodal Communication highlights some issues posed by the expected format of the academic output—that is, the usual article templates. In the chapter “Rethinking the Academic Artefacts” Gunnar Almevik and Jonathan Westin review and analyse examples of multimodality in practice-led research outputs with the objective of pointing out and discussing the strengths and weaknesses of different media and formats of dissemination. The text undertakes an epistemological perspective on the restrictions related to contemporary academic artefacts, such as in the article formats, with the aim of eliciting paths to create, and advocate acceptance for, more relevant academic artefacts—that is, forms of dissemination for craft research. In the chapter “Video as a Tool for Knowing and Telling in Practice-led Craft Research” by Camilla Groth, this discussion is taken further as the author points to the limitations of the written word in communicating the more experiential aspects of the research that are important in the specific research context, such as the physical actions and movements of the practitioner and their sensory perceptions, both of which may convey important information. The text-based academic artefact is thus challenged, and alternative forms of media, such as audio-visual links in articles or three-dimensional object files, are argued for instead. In this vein, Ulrik Hjort-Lassen also uses video in his attempts to convey his timber-framing craft skills to the next generation through the development of learning resources, as presented in the chapter “Making Instructions: Developing Learning Resources in the Craft of Timber Framing”.

Gunnar Almevik is a building conservator and professor in Conservation at the University of Gothenburg. His research, with a keen interest in methodology, crosses the fields of cultural heritage, material culture and making. He led vocational craft careers for carpenters, maisons and gardeners into higher education in Sweden, and established the Craft Laboratory to bridge research and practice. Much of his research is cunducted in multi- and transdisciplinary collaboration and in real settings where practice is integrated in the research.

Jonathan Westin is associate professor in conservation and research coordinator at the Centre for Digital Humanities at University of Gothenburg. He is a cluster leader within the Centre for Critical Heritage Studies, and member of the Getty Ancient Itineraries Institute. In his research he studies how perceptions of culture are formed through representations, and how these representations become part of our cultural heritage. By focusing on the communicative aspects of culture management, archives, and reconstructions, he approaches cultural heritage as the product of both curation and engagement. He holds a Master's degree in Ancient Archaeology.

KEYWORDS: Craft research, non-traditional research output, research communication, scientific visualisation, video article.

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Rethinking the Academic Artefacts

By Gunnar Almevik & Jonathan Westin

INTRODUCTION

The realm of craft is the processes of making, and craft research is characterised by using practice in the pursuit of an idea, a question, or a problem. Consequently, the communication of craft research needs to substantiate the process of making: its motion, sensation, vision, and haptic experience. In contrast, though it could be argued that modern science has always been the systematic description of such characteristics, the academic system is very much reliant on textual output. As a result, the mainstream academic process focuses on the production of written descriptions through various outputs of textual genres, such as full research articles, conference papers, technical reports, case-studies, reviews, books, and research applications. To conform to these genres, the studies or projects need to be translated into words, a process further disciplined by the accepted disposition and rules of the format. If there are any directions for visual material, these are generally limited to the number of illustrations allowed, and the size and format of the digital file. The few existing journals with outspoken aims to publish craft research, such as *Craft Research Journal*, *Journal of Modern Crafts, Journal of Intangible Heritage*, *Studies in Material Thinking*, *FormAkademisk*, and *Techne Series*, are essentially mainstreamed and text-based.

The methods of crafts are explorative and systematic in similar ways to the making of scientific research. Pamela Smith's work underpins scholarship in the area of craft. In her research, she discloses how modern science is indebted to craft sources and craft knowledge making (Smith et al. 2017; Smith 2018). Bertil Rolf makes the same observation but argues that, while the processes are the same in sciences and master crafts, the outputs are different (Rolf 1991; 2017). The craft masters' knowledge making is a means to skilfully and efficiently produce, while scientific academic production aims at new knowledge per se. The traditional craft outputs—the furniture, textiles, or buildings to name just a few—attend to clients' demands and praxis of the guild but they don't usually declare how they were made, which questions arose during the process, or how those problems were solved. When traditional crafts now enter the academic society, the craftspeople have to produce a new kind of output and attend also to the praxis of academic society. This may be a major challenge for a practitioner researcher.

This chapter concerns the assessment and communication of science-based craft research, with particular focus on how procedures and formats may be adapted to better serve the communication of evidence-based craft research. Extensive research exists on multimodal methods for data collection and data analysis in the field of craft research, for instance how film may disclose craft skills or embodied knowledge (Wood 2006; Almevik, Jarefjäll and Samuelsson 2013; Gowlland 2015; Groth, Mäkelä and Seitamaa-Hakkarainen 2015) or how 3D representations may assist in the exploration of materiality (Chittenden 2018). Craft research has also picked up and adapted methods from other areas like time-geography (Eriksson et al. 2019), dance notation (Høgseth 2012), quality content analysis (Andersson and Johansson 2017), and olfactory description (Källbom et al. 2018) to better capture the modality of craft making. What is less attended to is how to integrate the multimodality of these methods and new technologies in the actual research outputs. What is required of a film, a 3D model or an interactive application as a research output? What scholar norms for research communication must be attended to? How can these new technologies be disciplined in a way that bridges the double-folded demand of rigour and relevance? This chapter presents a review based on literature, scholar debate, and practice cases of assessment and communication of multimodal and non-traditional research outputs. The aim is to point at possible paths for researchers and doctorates as well as supervisors and reviewers to follow in the making and assessment of research outputs in regard of craft research.

NON-TRADITIONAL RESEARCH OUTPUTS

Differentiated Needs in Craft Research

The opportunities for publishing craft research, maintaining its full breadth and depth, depend on the character of the research. Craft research is conducted in different academic disciplines and subject fields and with distinct perspectives and approaches (Almevik 2017; Kokko et al. 2020). By far the most common type of craft research published in books and journals could be referred to as research *into* craft, referring to Herbert Read (1955) and Christopher Frayling's (1993; 1997) characterisation, where crafts are subjects to be looked into from an outsider's perspective, or to be scrutinised with a meta perspective. This craft research has a longstanding tradition in art history, archaeology, ethnology, and anthropology, and with research interest for the history, meanings, discourses, perceptions, expressions, or functions of crafted objects or craft subjects. Research into craft is comfortable in the traditional forms for research communication and there also exists a broad range of journals where craft is considered to be a relevant case or phenomenon for study, be that within archaeology, heritage studies, conservation, or anthropology.

The kind of craft research that is focused upon in this chapter, and that also has particular needs for multimodal research communication, has been referred to as *practice-led research* (Rust, Mottram and Elshaw 2007), *practitioner research* (Pilkington 2009), *experiential research* (Niedderer and Reilly

2010), or research *through* craft (Frayling 1997; Gray 1998), where the craft practice plays an instrumental part in an inquiry. This craft research often demands augmented means to represent the nuances of procedures and qualities in practice to underpin the results; a film may be essential to display variants of a motion or to substantiate the analysis of sensory affect; a detailed 3D model of a tool, material, or construction may be essential to outline the inquiry. The formal delimitations of the accepted research outputs may thus affect the credibility and stringency of the research.

Traditional Sciences and Artistic Research

There is potential within the academic system to describe a research process through non-textual outputs that might better capture important nuances of the craft practice, and which might also better encourage the development of pioneering fields of research. Since the mid-1990s, visual anthropology has developed perspectives and approaches not only to study visual representation but also to use new media to perform research (Sullivan 2010; Pink 2011). Furthermore, today, new technology offers a wide range of formats that can enhance research communication and reduce the loss of information in translations between modes, medias, and formats. The latest turn in informatics, digital humanities, and multimodal anthropology explores how gaming, social networking, and immersive or augmented reality technologies are reshaping societal practices including, as well, the practice of research (Gubrium, Harper and Otanez 2015; Pink et al. 2015; Collins, Durington and Harjant 2017).

The most ground-breaking approaches have been developed in artistic and creative fields in Arts and Architecture (Mäkelä and Routarinne 2006; Nelson 2013; Nilsson, Dunin-Woyseth and Janssens 2017; Solberg 2017; Wilson 2017) in a European perspective driven by the 1999 Bologna process to harmonise higher education in three cycles to doctoral level (Bologna Process 1999; 2003). The concept of non-traditional research outputs, with the acronym NTROs, involves original, recorded, or rendered creative works and curated public exhibitions and performances. The NTROs have a stronghold in artistic research and have to some extent earned wider academic recognition. Research councils and national assessment bodies in Australia and the United Kingdom have, for instance, come to include NTROs in guidelines for assessment of research and also systems for data management (ARC 2014; University of Sidney 2014; Barwick and Toltz 2017). The *Society for Artistic Research* (SAR) has launched the *Research Catalogue* (RC), a database for artistic research where sound, images, video, and text can be combined in an integrated format for presentation.

However, the systems for publishing artistic research are no open and shut cases for craft research; many craft subjects are organised in faculties of technology, pedagogy, natural sciences, or cultural sciences, and are directed to traditional forms and systems for publishing. The division between the traditional sciences and artistic research is substantiated by regulations, separating for instance the qualifications of Doctorates in the Arts from the common science-based [in Swedish *vetenskaplig grund*] Doctor of Philosophy. The divide is augmented by the sundered academic cultures, one side with scepticism that traditional research and formal frameworks harm the characteristics of the creative practices, the other side fearing that the diverse and flexible artistic research will dilute the concept of research (Borgdorff 2012; Solberg 2017, 245; see also Prop 2008/09, 134).

The "Sui Generis Perspective"

The NTROs are often compromised between, on the one hand, the mainstream text-based formats for research communication, and, on the other hand, the strongly individualised and somehow inscrutable artistic forms of communication. In the artistic research tradition there is a strong line of argument that the inquiry and thinking is an amalgam, embodied in the output. In the Nordic countries, the incorporation of arts and creative practices into doctoral education emphasises a research perspective that Henk Borgdorff has referred to as a "sui generis perspective" (Schwab and Borgdorff 2014, 148) and Christopher Frayling names "research *for* the arts" (Frayling 1993, 5), where the fine, applied, and performing arts are advocated as a class by itself. The artwork and masterpiece that is defined as the research output may be immovable, irreplicable, or even ephemeral in an event that occurred just there and then and totally disclosed from here and now. The skill of representing the artwork or masterpiece in a way that allows it to be distributed and shared is not consequently regarded as a necessary possession of the creative researcher (Almevik 2019). When, for instance, the Swedish Higher Education Authority (UKÄ) evaluate the quality of education and research, they acknowledge "other non-verbal ways of expressions" in scholarly work. In the official conclusion of a large evaluation of degrees in arts, craft, and design, UKÄ criticised universities for not possessing better competence for documenting students' independent work (UKÄ 2014). Through their wording, this competence is regarded by UKÄ as an institutional responsibility rather than a necessary skill of the student or researcher. Regardless of discipline, many researchers may agree that doing research and writing an article of the research are different processes, but the writing is not something that can be outsourced from the research. The research continues throughout the process of peer review until it is published. A researcher may get help through feedback from peer readers, translation, and proofreading. Furthermore, a research-group may have a division of responsibility where some contribute more to the writing, but the means to produce the research output is an integral part of the generic research skills.

The conception and frameworks for NTROs unfortunately focus only on the artistic outputs to which there are no discipline strategies. On the contrary, the Research Catalogue (RC) stated that their motive is to deviate from standards and to let the artist/researcher decide for herself/himself the visual disposition and the different media format(s) that they wish to focus on.[1] The NTROs are negatively defined as a non-traditional academic divergent. Robin Burgess, Repository and Digitisation Manager at the University of Sydney, points at the problems associated with the extent and heterogeneity of the material. The research communication becomes a data management problem when researchers hand in extensive amounts of material and all kinds of elements from their research process, like protocols, sketchbooks, logbooks, and photography repositories. Furthermore, the fussiness of the outputs which fall under the broad term of NTROs affects its academic status: "It can be stated that many people put less value on the contribution that non-traditional research provides for society. It might not be ground breaking scientific research, but what it can be seen as doing is enriching our lives and improving our wellbeing, providing us with an alternative way of thinking and invoking conversation" (Burgess 2017). While well-meaning, it is problematic if the NTROs are perceived as in-capable of providing society with ground-breaking research. The research output is usually grounded on and referenced to a repository from the research process, but the repository and the output are not an equivalent. Anne Solberg, who has investigated the academisation of creative practices, points towards the necessity of developing research strategies for an "inside perspective" into the making of knowledge around creative practices. Nevertheless, she states that this integrity may not be achieved in isolation: "What is needed is to go for the position inside academia, building an epistemological platform inside the academy, and learning from existing academic disciplines when that proves to be fortunate" (Solberg 2017, 246).

ASSESSMENT OF RESEARCH

The Normative Structure in Science and the System of Peer Review

The use of *science* in this book does not exclusively refer to traditional natural science disciplines and the deductive hypothesis-driven research, often referred to as "the Scientific Method." In Nordic languages, science refers to the wider concept *vetenskap/videnskab/vitenskap* [Swedish/Danish/Norwegian], or *tiede* [Finnish], denominating the common academic production of knowledge that is not defined as artistic. Science is, in this sense, synonymous with systematic, academic, scholarly, or evidence-based knowledge. The word *science* is a noun but also implies the active verb to produce science through research. With a constructive perspective on knowledge, there are no universal laws to define science (Kuhn [1962] 2009). There exist, however, norms that are negotiated, accepted, and widely implemented in academic systems. Robert Merton's essay on the normative structure in science evolves around four concepts, *communism*, *universalism*, *disinterestedness*, and *organised scepticism*, also referred to as the Mertonian norms or CUDOS norms (Merton [1942] 1973). These norms recur in the creative practices as well, but also disclose epistemological disparities (Kaiser 2000).

Communism refers to science as a common good and a contribution to collective collaboration (Merton [1942] 1973, 273; see also Munafo et al. 2017). Research and systematic knowledge may exist in closure, but science is a creative commons that does not exist in a vacuum or concealment. The idea of an accumulative science has been disputed (see Kuhn [1962] 2009), but there is a wide acceptance that science has to be open for others to quote from and build upon. However, while a researcher needs no permission from the author to quote a statement from a scientific text, the reinforced copyright jurisdiction of visual expressions and artistic work may counteract the possibility for collective collaboration, and delimit the dialogue and transparent "hacking" of the arts and crafts (von Busch 2008). In creative research, the mediation of a tangible artwork or masterpiece is more frequently handed over to another person with technical skills; the filming, photographing, or programming. This position of dependence compromises both the authorship and communism of the research.

Universalism means that science should be independent of the situation, the individual context, or the socio-political context (Merton [1942] 1973, 270; see also Goodman, Fanelli and Ioannidis 2016). The idea of universalism recurs in the call for generalisability, objectivity, and repeatability as a claim that others should be able to come to the same result. The norm of universalism has been criticised from constructive and critical standpoints, contesting the idea of a purely objective and totally independent knowledge (e.g., Yin 1989;

Guba 1990; Strauss and Corbin 1998;). There are alternative concepts to universalism in science to better target the normative intent: the functionality of the results (Sjömar 2017), the confirmability and transferability (Niedderer 2009) or intersubjectivity within a community of practitioners (Kaiser 2000), or the connectedness to the reality of a practice (Molander 2017).

Disinterestedness is the exaction of an unbiased science (Merton [1942] 1973, 270). There can be no conflict of interest or crafting of science in a particular way to benefit a company or an individual. The increase of exploitive academic publishing businesses, also referred to as predatory or write-only publishing businesses who profit from authors fees by fast publishing texts with a poor academic standard, is a debated problem. In the following text, we will discuss a problem of disinterestedness, when the infrastructure for multimodal research has strong commercial interests in fields which are not always coherent with sound research ethics.

Organised scepticism is the last of the Mertonian norms claiming that science has to be critically scrutinised (Merton [1942] 1973, 277). The predominant method for organised scepticism is the system of peer review. A *peer* in this context is an expert in the field with the ability to scrutinise others who are experts in the same field (Kelly, Sadeghieh and Adeli 2014). A peer reviewer is expected to make accountable judgements on the quality of research from an insider's perspective. The peer review process serves mainly two purposes: firstly, to determine whether the research reaches an acceptable standard of quality for publishing; secondly, to help the authors to improve the quality of an accepted manuscript. In this regard, the reviewers' critique is both a verdict and a gift.

There exist biases and indiscretion among reviewers, and the process may be inert and opaque (Weller 2001). The harshest critics state that the system is unscientific and effectively working as a black box (Smith 2006). Despite criticism, the system has no real alternative and is still considered a viable form of scientific evaluation by the scholars themselves (Publishing Research Consortium 2016). Basically, the academic system for assessment of research through peer review is the same as the guild's tradition of assessing craft knowledge and skills.

Concerning new academic fields, with strong connections to a professional field of practice, the antecedent judgement of who is a suitable peer reviewer may hold the real problem. There is a natural scarcity of reviewers with both high academic merits and insider perspective—i.e., peers. When the emerging pieces of research are to be evaluated in such circumstances, there is a risk that traditional disciplinary formats and research strategies are favoured and, furthermore, that the particular significance for the craft subject is foreseen.

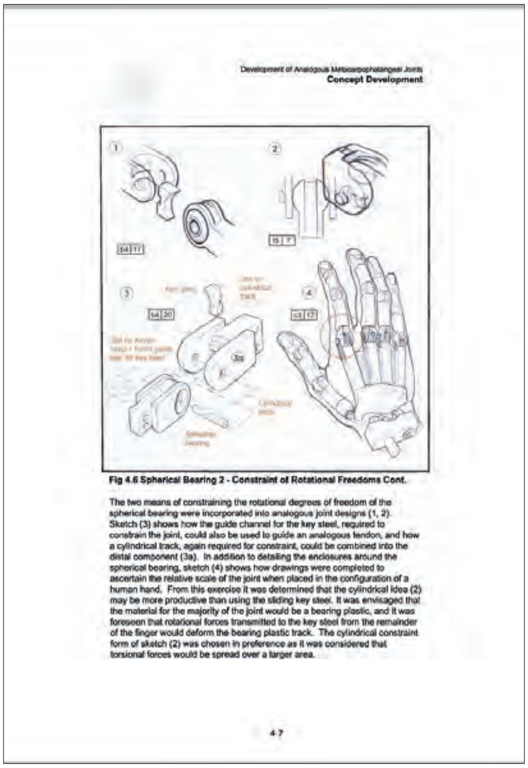
Criteria for Assessment of Craft Research

Each research council, faculty, and publishing house has its own criteria for assessment of the quality of research. Ticking all the boxes in assessing craftsmanship in science involves both attending to detailed formal and 'provincial' regulations, and generic epistemological requirements. The researcher has to adopt particular requirements of language and grammar, specific reference systems, and any specified formats for communication. The editor of a journal will make sure the author has followed the journal's guidelines before initiating a review process. A dissertation in one faculty has to be a monograph and in another faculty has to be a compiled thesis. One supervisor tells the doctorate student that science can never be written in the first person, while yet another urges the student to be more personal and self-reflecting.

Baseline requirements in formal peer review procedures are the *original contribution* and the *overall quality of research*. Original means that it has not been done before, it is new; the contribution infers the value to the current field and the peers, and in rare cases to the whole world. *Significance* is sometimes used to encapsulate the originality and contribution of the research, pointing foremost at the results and conclusions. The most difficult question to assess is *the overall quality*. The scrutiny of overall quality is, to a large extent, handed over to the discretionary authority of the reviewers or examiners. A recurring concept is *rigour*, meaning the inner logic and coherence achieved through "the chain of reasoning" (Niedderer 2009). Rigour addresses research as a construct, and depicts how convincingly the academic artefact is made.

The assessment of craft research does not substantially differ from standard research. One characteristic for the kind of craft research in focus in this review is the instrumental use of practice. However, research is distinguished from practice. Stephen Scrivener proposes that research is scholarly "only if it is 1) a systematic investigation, 2) conducted intentionally, 3) to acquire new knowledge, understanding, insights, etc., that is 4) justified and 5) communicated 6) about a subject" (Scrivener 2009, 71). Chris Rust, Judith Mottram, and Mark Elshaw argue that research in creative practices must "prove the ownership" and claim the practice as research by 1) indicating the research problem and its rationale, 2) demonstrating a good understanding of the research context, 3) acquiring research methods and consolidating them in an explicit way that is understood by other researchers, and 4) verifying the results and contribution of their research (Rust, Mottram and Elshaw 2007, 75). Nigel Cross suggests that the best design research is "purposive, inquisitive, informed, methodical, and communicable" (Cross 2007, 126). A particular question of rigour pertains to the craft researcher intervening in practice and thereby affecting the results (Eriksson et al. 2019). The craft researchers use their own craft instrumentally as a method and sometimes also address themselves and their own practice in the research (Almevik, Jarefjäll and Samuelsson 2013). Consequently, a question for assessment is the methodological transparency and proofs of self-accounting and self-analysis in research (Pedgley 2007).

To conclude, well-established norms of what science is, as well as generic features of the system and criteria for assessment of quality of scientific research, do not in any way delimit augmented uses of visual medias and multimodal formats. However, the peer review process requires delimitations and calls on standards and discipline. The format has to enable the reviewer to comprehend and follow how the research is made and with what means. Furthermore, the assessment has to be feasible for the reviewer within some defined time-frame and comparability between different outputs. A full research paper that is submitted to a journal has some kind of restriction in word count, but how long should a filmed research output be? What measure of limitation is relevant for the extent and complexity of an interactive application? The standardisation in scholarly work is made for textual outputs, but what is a relevant system of references in a 3D model? How should Harvard or Oxford references be annotated in a research film?

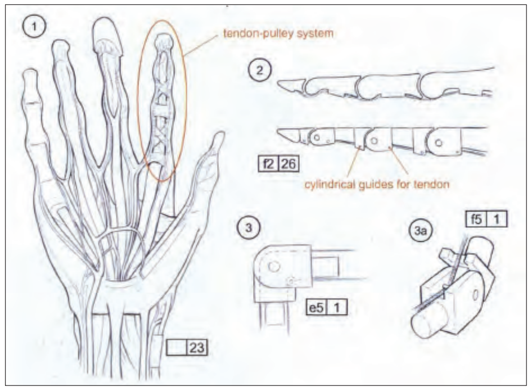


Development of Analogous Metacarpophalangeal Joints
Concept Development

Fig 4.6 Spherical Bearing 2 - Constraint of Rotational Freedoms Cont.

The two means of constraining the rotational degrees of freedom of the spherical bearing were incorporated into analogous joint designs (1, 2). Sketch (3) shows how the guide channel for the key steel, required to constrain the joint, could also be used to guide an analogous tendon, and how a cylindrical track, again required for constraint, could be combined into the distal component (3a). In addition to detailing the enclosures around the spherical bearing, sketch (4) shows how drawings were completed to ascertain the relative scale of the joint when placed in the configuration of a human hand. From this exercise it was determined that the cylindrical idea (2) may be more productive than using the sliding key steel. It was envisaged that the material for the majority of the joint would be a bearing plastic, and it was foreseen that rotational forces transmitted to the key steel from the remainder of the finger would deform the bearing plastic track. The cylindrical constraint form of sketch (2) was chosen in preference as it was considered that torsional forces would be spread over a larger area.

47

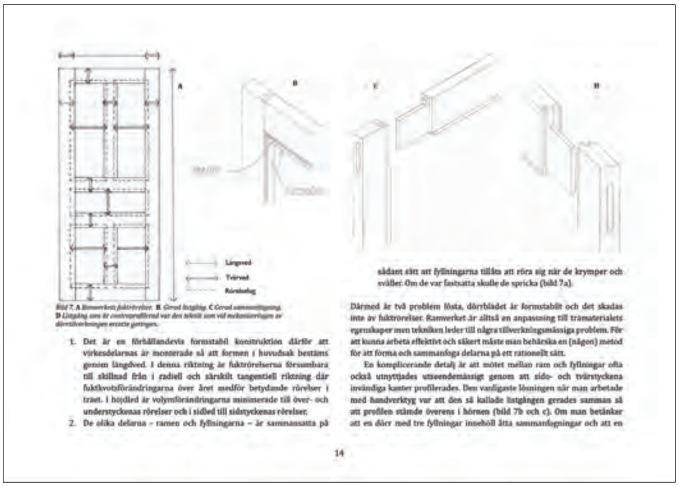


Figures 1 and 2: Graham Paul Whiteley's investigation "An Articulated Skeletal Analogy of the Human Upper-Limb" is an early example of a doctoral thesis in practice-led design research, presented at Sheffield Hallam University. The research process is iterative, combining the close study and scrutiny of the human anatomy, the physical model making, and the involvement from the end-users at an early stage in the development. Here, an image quotation (Whiteley 2000, 3–13, 4–7) of the "observational drawing" and "sketchbook idea development" are essential parts of the creative research method. The scientific visualisation is consequently presenting the content of the research integrated in the linear argumentation of the thesis. Images by Graham Paul Whiteley.

POSSIBILITIES WITHIN THE SYSTEM

Scientific Imaging

An integral part of doing research in long-standing sciences is to translate the study object into visual material that can then be compared and processed, and also shared and criticised. In early science publications we find artistic ink drawings of the objects of research; the cultural remains, body parts, plants and animals, often incorporated in typologies and taxonomies. In fact, one could argue that no scientific field is matured or even functional without a developed and agreed-upon method for translating aspects of the physical reality into visual media (Smiles and Mooser 2005). For instance, archaeological excavations were not scientific before there were section drawings and vase-profiles. The applied sciences still rely substantially on images to draw conclusions and bring evidence to support an argumentation. In publications detailing scientific conservation and archaeology, we frequently find images produced through new technologies, such as 3D recording, x-ray, and multispectral and reflective transformation imaging that make possible the visualisation of evidence or the augmenting of properties that would not otherwise be observable to the human eye (Payne 2012). These types of images have an undisputed scientific status, while other images are dispensable illustrations. The more theoretical an image is, the higher the scholarly status it gains (Latour 1990; Westin 2012). A drawing of a building's façade, for instance, is illustrating the obvious, while a ground plane or

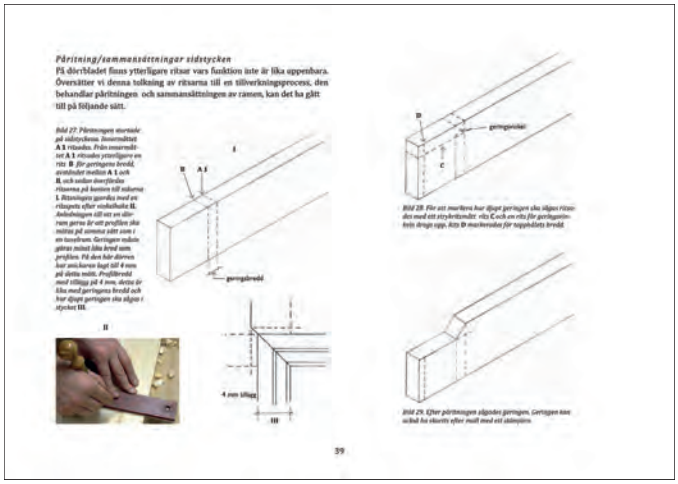


1. Det är en förhållandevis formstabil konstruktion därför att virkesdelarnas är monterade så att formen i huvudsak bestäms genom långved. I denna riktning är fuktrörelserna försumbara till skillnad från i radiell och särskilt tangentiell riktning där fuktkvotsförändringarna över året medför betydande rörelser i träet. I höjdled är volymförändringarna minimerade till över- och understyckenas rörelser och i sidled till sidstyckenas rörelser.
2. De olika delarna – ramen och fyllningarna – är sammansatta på sådant sätt att fyllningarna tillåts att röra sig när de krymper och sväller. Om de var fastsatta skulle de spricka (bild 7a).

Därmed är två problem lösta, dörrbladet är formstabilt och det skadas inte av fuktrörelser. Ramverket är alltså en anpassning till trämaterialets egenskaper men tekniken leder till några tillverkningsmässiga problem. För att kunna arbeta effektivt och säkert måste man behärska en (någon) metod för att forma och sammanfoga delarna på ett rationellt sätt.

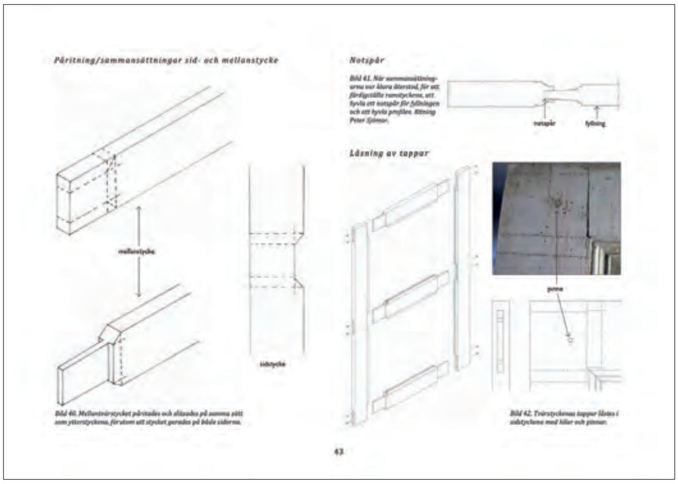
En komplicerande detalj är att mötet mellan ram och fyllningar ofta också utnyttjades utseendemässigt genom att sido- och tvärstyckena invändiga kanter profilerades. Den vanligaste lösningen när man arbetade med handverktyg var att den så kallade listgången gerades samman så att profilen stämde överens i hörnen (bild 7b och c). Om man betänker att en dörr med tre fyllningar innehöll åtta sammanfogningar och att en

14


Påritning/sammansättningar sidstycken

På dörrbladet finns ytterligare ritsar vars funktion inte är lika uppenbara. Översätter vi denna tolkning av ritsarna till en tillverkningsprocess, den behandlar påritningen och sammansättningen av ramen, kan det ha gått till på följande sätt.

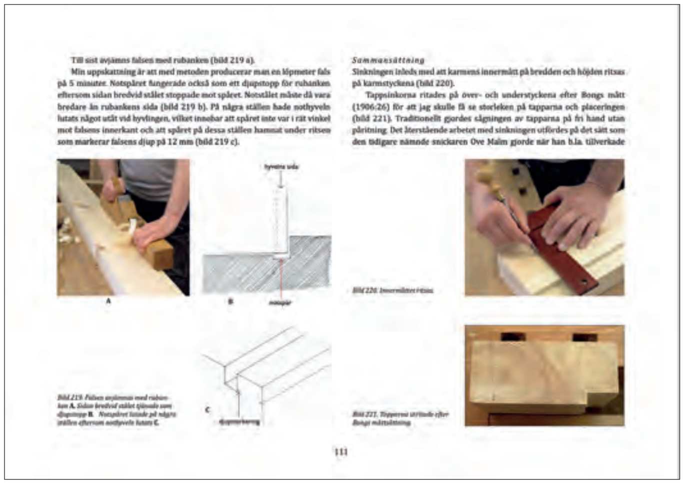
39


Påritning/sammansättningar sid- och mellanstycke

Notspår

Låsning av tappar

43


Till sist avjämns falsen med rubanken (bild 219 a).

Min uppskattning är att med metoden producerar man en löpmeter fals på 5 minuter. Notspåret fungerade också som ett djupstopp för rubanken eftersom sidan bredvid stålet stoppade mot spåret. Notstålet måste då vara bredare än rubankens sida (bild 219 b). På några ställen hade nothyveln lutats något utåt vid hyvlingen, vilket innebar att spåret inte var i rät vinkel mot falsens innerkant och att spåret på dessa ställen hamnat under ritsen som markerar falsens djup på 12 mm (bild 219 c).

Sammansättning

Sinkningen inleds med att karmens innermått på bredden och höjden ritsas på karmstyckena (bild 220).

Tappsinkorna ritades på över- och understyckena efter Bongs mått (1906:26) för att jag skulle få se storleken på tapparna och placeringen (bild 221). Traditionellt gjordes sågningen av tapparna på fri hand utan påritning. Det återstående arbetet med sinkningen utfördes på det sätt som den tidigare nämnde snickaren Ove Malm gjorde när han b.la. tillverkade

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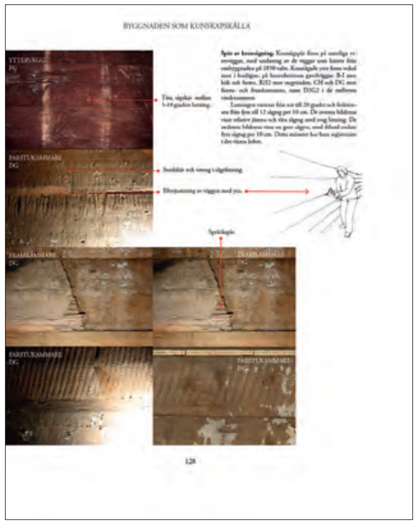
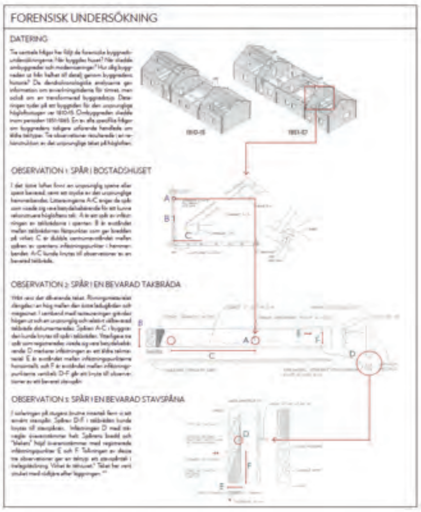
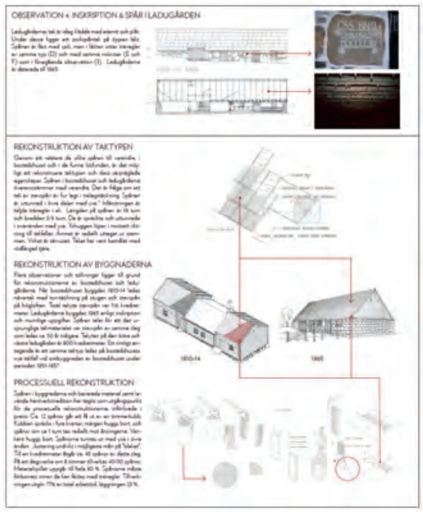
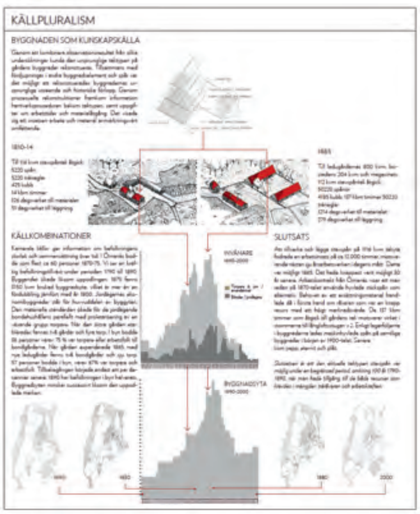
Figures 3–6: A peculiar observation in our review is that the sequential imaging of procedures in the craft making, the visualisation in a 2D step-by-step of how something is done, is rarely seen in craft research publication. On the other hand, there is frequent aesthetic imaging of craftspeople in a setting of action but with a shallow message of content. Our hypothesis is that the sequential imaging is negatively associated with the method's time measurement, and also from the genre of technical instruction and do-it-yourself tutorials. There are, however, exceptions. Above is an image quotation of Tomas Karlsson's thesis on the carpentry of framed doors (Karlsson 2013, 14, 39, 43, and 111). The scientific image is the main language for research communication on content, and the procedural images are used to interpret historical sources, articulate the hypothesis for the research, depict the craft experiments, and also to substantiate results and conclusion. Images by Gunnar Almevik.









Figures 7–11: Gunnar Almevik employs a 'forensic' perspective in building history studies, where properties and traces in buildings are interrogated and assessed as possible evidence to a narrative on meaning. Like a crime scene investigation, the chronology and reconstruction of events establish the foundation for interpretation. Similar to the process of justice, the goal is not only to disclose what occurred but also why. Presented above is an image quotation (Almevik 2012, 124, 128, and 327–329) of the line of argumentation, evidencing that the transformation of a historic building, considering the extent of craft labour and materials, correlated with the concurrent transformation of demography and landscape, is feasible only in a short period in history. Images by Gunnar Almevik.

section drawing represents a theoretical view which requires a deeper analysis to produce and also a higher preunderstanding. However, it is rare that any of these images constitute research by themselves as they are primarily visual representations of a tangible reality. This could be contrasted with visual methodologies such as time-geography—an analytical method of mapping out procedures in relation to a spatial context—and space syntax—an analysis of spatial relations, where the production of the image is central to the thought-process and the argumentation. The resulting visual output thus carries much of the analytical processing of the scientific work, and might in some cases be the main outcome of research rather than a stepping stone towards textual argumentation. These examples, however, do not constitute any conflict with traditional research communication, as it is possible to present the images as conventional 2D images. Recently, publishing houses have developed ways of augmenting the text-based research paper with new visual media and data in formats other than text, images, or diagrams. This progress has been made possible by an increased readership online, and online-only journals. Several of the large publishing houses offer authors the opportunity to hyperlink supplementary material to their article that may be uploaded in a wide range of formats and, for large data sets, to external multimedia platforms such as *FigShare*, *DataCite*, or *ScholeXplorer*. The digital interface enables readers to navigate between the published article and associated data sets. However, the supplementary material is not necessarily scrutinised in the peer review process. For instance, the publishing house Taylor & Francis informs the authors that extensive analytical supplemental material should "ideally be subject to peer review."[2]

Interactive 3D Representation

There has been ample research on the technical aspects of new media and how digital technologies can be utilised to communicate research (see Debevec 2005; Pollini, Swartz and Kensek 2005; Kahr-Højland 2007). The continuous development of 3D software, adapted for a broad variety of users and fields of application, provides the potential to amend traditional research outputs. In the context of academic work and publishing, 3D documentation and visualisation have several advantages as they capture and communicate more of the objects through the user's ability to manipulate the rotation, size, and perspectives directly. In other words, 3D models allow for a spatial understanding that other types of documentation cannot provide (Galeazzi 2015). 3D modelling is considered a basic competence in many craft fields today, and accessible software provide tools to not only model forms but also to layer, texture, light, render, annotate, and animate the computed models for a rich variety of outputs. The documentation and scanning technologies are also advancing. Photogrammetric triangulation, where measure points in 3D are calculated with data through digital 2D photography, is an assessable technology with increased impact in both research and practice (Historic England 2017). Another approachable technology is 360° video to provide a point-of-view capture of the human body in action (Thane 2019).

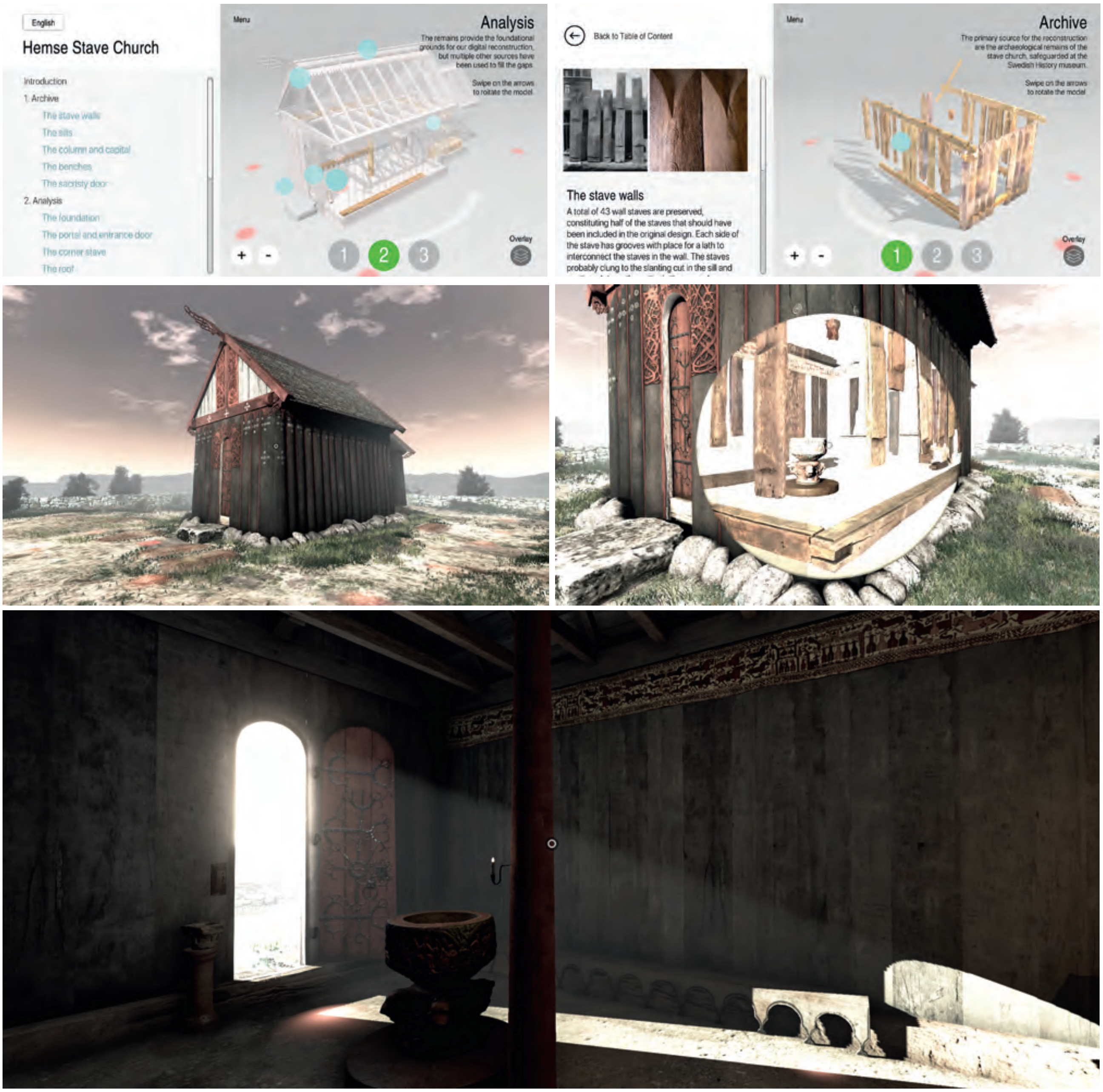
There are some initiatives that may pave the way for including 3D elements in research outputs. Taylor & Francis, for instance, has partnered with Sketchfab to allow researchers to publish 3D models in their online publications, making them the first major publisher to incorporate such models within the web-version of the articles they publish. As the viewer is integrated in the online journal,

Figures 12–13: Interactive 3D communivation of the National Archaeological Museum of Venice's investigation of a wooden casket reliquary from 400 AD using 3DHOP's resource. The reader may rotate the 3D model, take measurements, and also access annotated information through marked up areas of interest. Images by National Archaeological Museum of Venice.

the reader does not have to navigate away from the research output as an entity. However, Sketchfab is a commercial platform that may compromise the disinterest of scholarly research—but there are few alternatives. Model Viewer, Potree, and 3DHOP are alternative open-source frameworks for interactive web presentations of 3D models (meshes and pointclouds) through JavaScript components. As with Sketchfab, high resolution models can be embedded in online material and thus seamlessly integrated into the research output.

However, despite the recognised possibilities and the rigour that goes into the production of highly scientific 3D models, there are still no widely accepted procedures to publish and assess 3D outputs in their own right. The use of interactive 3D communication demands an epistemological change in how we approach and make use of research outputs. The basis for 3D communication is the interactivity where the user may roam the model or environment. The 3D models being rich in detail but also overloaded with information complicate the evaluation process for the peers and reviewers as it can be hard to discern what to focus on. On a general level, interactive 3D communication as a form of research output needs a notation system to direct the viewer's attention to details, and to guide the inspector of the model in the line of the relevant argumentation. Commercial 3D visualisation platforms such as Sketchfab offer the possibility of tagging hotspots on a model that, with a number series, may guide the user through the visual data. It would be possible to ground the structure of the research output on a model or series of models, and provide references and the meta narrative of research with a conventional IMRAD structure through the tags.

A 3D model may represent a real artefact or environment but all existing technologies mediate, reduce, and to some extent also manipulate the qualities. Taylor & Francis ask the authors to be as transparent as possible, particularly in terms of how the model is optimised or refined by postprocessing tools. The publisher refers to good practices developed in cultural heritage, and particularly the London Charter for computer-based visualisation. The Charter emphasises using computer-based visualisations only when the situation dictates that they will be useful, that research sources should be evaluated in a structured way, and that the individual communicating the visualisations must provide sufficient information about methods and outcomes which can be understood in relation to the context and purpose for which they are deployed.



Figures 14–18: The Biennial International Conference for the Craft Sciences (BICCS) 2021, in collaboration with the Swedish Craft Laboratory and Center for Digital Humanities at the University of Gothenburg and *FormAkademisk* journal, opened for interactive applications as research outputs, along with submissions of multimedia papers, film articles, and traditional research papers or in situ communicated and filmed exhibitions and performances. The interactive article "Crafting Research Communication in Building History" is probably the first interactive file that has ever been produced as a research output which has been scholarly scrutinised in a double-blind peer review process. The interactive article is produced in Unity 3D, different versions of which can be exported and installed depending on the user's operative system. The article concerns an investigation and digital reconstruction of the archaeological remains of a stave church. Above is an image quotation (Westin and Almevik 2021) showing the application's chapter structure, with an introduction presenting the research, a display in 3D of the archaeological sources, an analysis where primary sources and analogies are contextualised as a stave church assemblage, and the result as an immersive interactive reconstruction of the building that the reader may roam. The reader is, in the immersive first-person view in the last chapter of the application, provided with a lens to inspect what are the existing remains and what are interpretations. Images by Jonathan Westin and Gunnar Almevik.

Research Film

Video is a frequent method of data collection in many research practices and not least in craft research (see Groth in this publication). Video capture provides a rich document for analysis through various approaches like skills analysis in anthropology and ethnomethodology (Gowlland 2015; Ivarsson 2017), micro analysis of interaction (Johansson and Illum 2009), gesture analysis and self-study of embodied cognition (Høgseth 2007; Groth 2017) or in spatial studies like time-geography (Jarefjäll 2017). In the final research output the video is, however, most frequently represented by a screenshot image. Video clips may at best be included in the research, provided through a link to an external video platform, appended to the output or eventually embedded in the research output per se. What is the possibility of producing a film as a research output per se? Digital video is easy assessable, possible to enclose and transfer as a document, and also possible to embed in other document types and platforms. The linearity is similar to text and can be used to convey research with a clear line of argumentation and also in the IMRAD structure. The digital format makes it easy for the viewer to go back and forth and also stop at sections with, for instance, text-based information.

The *Journal of Video Experiment* (*JoVE*), the *Journal of Anthropological Films (JAF)* and the *Video Journal of Education and Pedagogy* (*VJEP*) are three journals sharing the conviction that video is a relevant and beneficial media for research communication. *Journal of Video Ethnography* (*JVE*) was another film journal that has now been closed down. *JAF* publishes "original, empirically based contributions that present new insights to the study of human behaviour through audio-visual means". The journal has few instructions, but the film should be based on ”longer term fieldwork and methods of research". *JAF* considers films that stand alone as original, empirical contributions, as *JVE* would not consider "decontextualised 'clips' or videos that require text documents to be understood."[3] *VJEP*, on the contrary, emphasise the corroboration of text and video in the output: "Authors should assume that the video component is not intended to be viewed in isolation but is always contextualised within the framework outlined by the written component."[4] *JVE* ask for a mandatory extended abstract with a summary of the content, a statement on the methodology, the main findings conveyed by the film, and a list of scholar references, in all delimited to 2,000 words, while *VJEP*'s articles are full research papers following conventional style guidelines.

JoVE is another journal that seeks to fill a gap in scholarly publishing, applied in physical and life sciences. *JoVE* publishes "video method articles" with the intention of ensuring "a more effective transfer of information and experimental detail than with traditional text-based articles."[5] *JoVE* publishes research in traditional science fields but the journal's focus on the research practice and uses of method is also relevant to craft sciences, where the practice often plays an instrumental role as a research method.

JoVE and *VJEP* provide the server and platform where the research is stored and displayed, while *JVE* imbue the submissions to get a Vimeo account, a commercial video platform, from where the journal embed a link. The three video journals have different approaches in how to guide and standardise the submissions. *JVE* has few restrictions other than technical directives on file formats and size, and issues of copyright and consent. The submitted research film shall not exceed 360 minutes

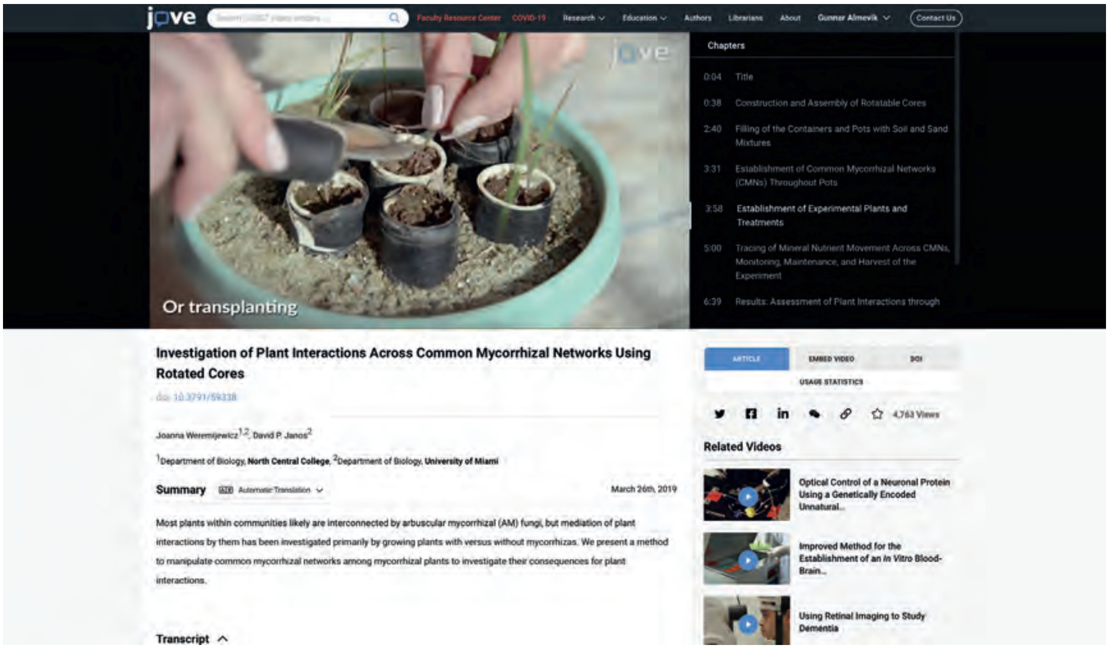


Figure 19: Johanna Weremijewicz and David Janos's video method article on plant interactions in JoVE (Weremijewicz and Janos 2019). The article concerns a method to manipulate mycorrhizal networks to investigate how plants interact, and the video provides an opportunity to demonstrate the practice of the method. The video is divided into chapters and JoVE's online interface presents the video alongside the table of contents with time references instead of page numbers. Below is a short written summary and a window to expand a description of the method. In the digital object identifier (DOI) window, there is text corresponding to the chapters of the film following the discipline of an introduction to the research, a practice-oriented method protocol, an outline of representative results, and discussion. This text can be downloaded in PDF. Images from JoVE and Johanna Weremijewicz and David Janos's article.

and at least 80% of the footage must be recorded by the author(s). *VJEP* also provides basic instructions for the "video component," that can be one or several clips but which altogether must not exceed 15 minutes. There must be an English audio narration and the author should avoid fancy transitions and music soundtracks without copyright. The video component may have different purposes in the article, like an extract of data for illustration, a summary, or commentary, but *VJEP*'s articles, in our opinion, appear much as embedded supplementary material while the text is still the hegemonic media for communication. *JoVE* has a totally different approach, as a team from the journal makes the footage and edits the research film into a standardised format. The researcher writes a text protocol for a "video methods article" that includes the standard title, abstract, keywords, and references, but which is mainly devoted to "a detailed description to enable the accurate replication of the presented method by both experts and researchers new to the field" and furthermore "a concisely written description of representative outcomes following the use of this method."[6] The journal first makes an evaluation on the feasibility of filming and whether the science can properly be visualised through film.

Lack of a standardised structure may be a challenge to both reviewers and peers of the research. Most text-based journals have a similar structure in the line of argumentation, and delimitations measured in words or characters, typically from 3,000 to 10,000 *words* in length. What would be an equal length for a research film? A six-hour long research film in *JVE* without any specific limits on the line of argumentation would require a lot of reviewers and peers. *VJEP*'s emphasis on the written part and the video component operate together. The journal suggests that a 15-minute video could corroborate with a 3,000-word text, but if the video is shorter, the text may be extended to 4,000 words. The common video method article in *JoVE* is between 10 and 15 minutes and is sectioned into chapters, basically in the IMRAD structure. The video is displayed on the journal's web portal with the table of contents, the video timeline, and the text protocol constantly visible, so the viewer can stay oriented and can concurrently assimilate both the written and audio-visual content.

Multimodal Platforms

An early initiative of multimodal publication was *Vectors Journal* that already in 2005 provided peer review and online publication of research in mutable and multiple forms. Until 2013 the journal encouraged "a fusion of old and new media in order to foster ways of knowing and seeing that expand the rigid text-based paradigms of traditional scholarship".[7] Today, most research is published online with the possibility of downloading a document in Portable Document Format (PDF). In the exclusive online publication, various media like 3D models, video, or sound clips may be embedded in the research output. In the field of artistic research we find examples of designated multimodal journals like *Journal of Artistic Research* (*JAR*) which publishes artistic research online in a format like an art exhibition. This online research exhibition combines the standard elements such as title, abstract, keywords, and table of contents but with a spatial representation of an exposition where text, images, video, and sound are artistically allocated (further reading in Schwab 2011; Schwab and Borgdorff 2014). The interface of *JAR* is arranged like a spatial representation of an exhibition which the reader can roam. Any media files that work on other computers are accepted. The delimitation of submissions in *JAR* is not the number of characters or illustrations to a text, but "the exposition must not be too long." The time to access "all essential aspects of the exposition" should not exceed an hour of investigation.[8] The *Nordic Journal for Artistic Research*, inaugurated in 2018, is another journal that uses a digital exposition for publication. Both of these journals, as well as the *Journal of Sonic Studies*, are linked to the *Research Catalogue* from where elements in the database can be connected to a particular research output in the journals.

Online publication opens up the potential for multimodal means of communication. However, the downloadable documents commonly include only text and images. It is, of course, possible to use hyper-links but this forces the reader to leave the actual output, and it doesn't work in physical printing. With printed quick response codes (QR) the reader may access film and 3D models on the web but will need a mobile device to complement the reading. To use text and 2D images is functional in PDF but 3D media is hamstrung by lacking standards. While the Adobe PDF format supports 3D files, this is limited to the Universal 3D format, which is not supported by major modelling software. Furthermore, the interactive elements of these PDFs only

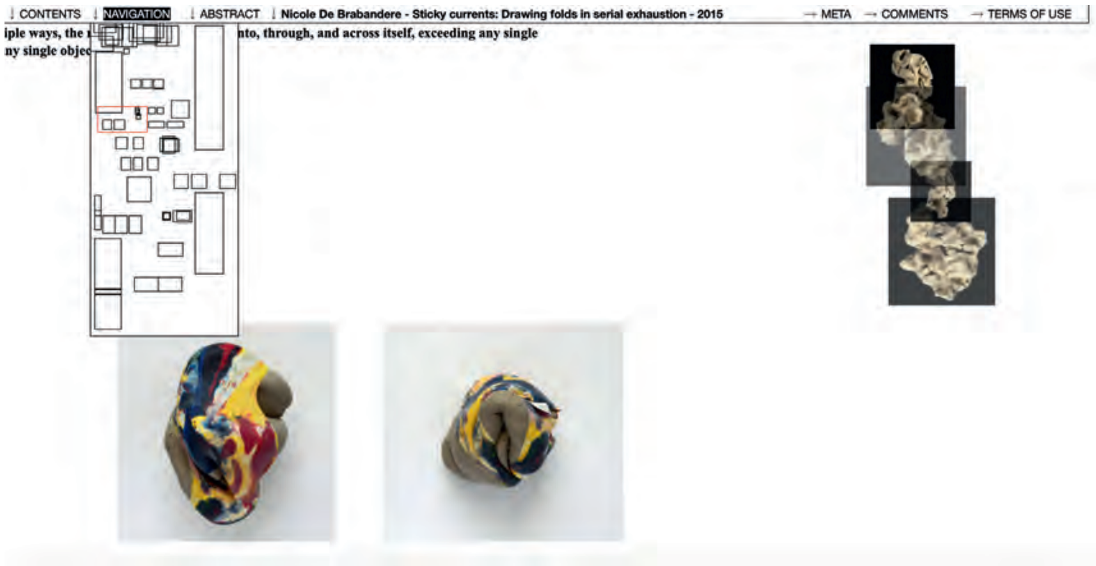


Figure 20: Nicole De Brabandere's research exposition (2015) "Sticky Currents: Drawing Folds in Serial Exhaustion" published in JAR. The exhibition seeks to activate affective qualities of surface and skin in drawing operations and wedging of clay. The interface provides an overview of the exhibition, like a spatial table of content that the reader can access and roam about. De Brabandere's displays evoke the embodied memory of compressing and folding clay and the materials sticking on skin by means of images, video, drawings, and texts. Images from JAR and Nicole De Brabandere research exposition.

function in Adobe's own PDF reader. The file size and compression possibilities are also a hinderance to, for instance, embedded video in the PDF.

An alternative technology that is less explored in research communication is the interactive file. Today there exist several integrated development environments and game engines that are more frequently used in commercial product demonstration and education and training. The training of surgeons and pilots involves, for instance, virtual reality applications as learning resources. Through these game engines, a physics-based interactive application can be published that assembles various digital assets in an interactive space where the corroborating effects of, for instance, movements, light, and sound can be simulated. The space may be displayed in the first person view or as a strategic overview and may also involve virtual multi-participation. The technology may combine interactivity where the reader/inspector/player roams the constructed space and a hierarchy of scenes or chapters where the narrative is constructed. The application can be exported for desktop use or for head-mounted virtual reality display. Combined with augmented reality software, the researcher may interconnect a digital research output with real places and materials (Liestøl 2011; Westin and Almevik 2017). The problem of a bisected thesis in a written part and an art or craft work could be bridged by this technology. The crafted object and the explanatory digital application could form a single unit as a research output.

RETHINKING THE ACADEMIC ARTEFACT

> "Research is a practice, writing is a practice,
> doing science is a practice."
> Christopher Frayling (1993, 4)

The craft sciences is a domain of subjects struggling with the academisation and transfers of people and discourses in their path from a field of practice to a field of inquiry. This domain of subjects needs a common strategy to maintain the inside perspectives throughout research communication. There has been extensive research and debate concerning the nature and quality of assessment of artistic and practice-led research (to which the craft subjects have been associated). The perspectives divide at, on the one hand, a "sui generis perspective," and on the other, a path of both crafting and adjusting to the norms of traditional sciences. We adhere to the latter perspective. The argumentation follows Anne Solberg, to seek a position inside academia and learn from traditional sciences when it proves to be suitable. On the other hand, if the craft sciences disconnect from their corresponding fields of practice, they will become obsolete and irrelevant. We argue that a core challenge to integrate the practice of craft in the scholarship of crafts is to find a relevant and rigorous way of assessment and communication of research.

The review presented in this chapter shows that the norms associated with science as a distinguished type of knowledge and the academic peer review system for the assessment of research are on a principal level neutral to the formats of how the research is communicated. However, the text has a hegemonic position by tradition and has been codified in a set of accepted genres where the full research article is the most common research output. The standard of the format is not unessential; the peer review system needs transparent, comparable, and thus disciplined outputs and also with delimitations which make the assessment feasible within a time frame. There are initiatives by publishing houses, universities, and faculties to provide alternative formats for multimodal research communication, but they generally lack standardisation and disciplined ways of dealing with length, references, research design, and line of argumentation. The conclusion points towards the need for complementary genres for research communication, adapted to multimodal media but in disciplined formats. There is also a need to support the complementary and subordinated position of text-based research communications like in extended abstracts, extended captions, and system of notations of 3D models and films.

We can point towards the film and the interactive application as being two useful media technologies for the communication of craft research. Both these technologies are multimodal as they can integrate video, sound, image, and text. The technologies can produce replicable copies of a narration or argumentation with an IMRAD structure and procedures for how to reference and communicate other works, making possible the referencing by others. It is also possible to standardise the format through minutes of a timeline, number of scenes, or level of depth. Furthermore, in an interactive application, using the game engine's software, the source material for an analysis can be included, whether it be the recording of an interview, 3D-scanned materiality, test results, or the entirety of a corpus, thus answering an age-long critique of the 'opaqueness' of the traditional academic outputs that has made it difficult to question, test, or reproduce published results. Through digital augmented reality layers, craft research communication may expand by interconnecting the real crafted objects and the meta perspective narrative of research. We have also pointed at the opportunity to benchmark existing formats like the 'video method article' and the 'filmed research article' with corroborating written and video components.

The concept *academic artefact* that appears in the title of this chapter has not been properly introduced or explained. The concept relates to our conclusion and discussion. We propose the concept to destabilise the conventional understanding of research communication. We are reluctant to accept a simple dichotomic division of traditional and non-traditional research outputs which clearly subordinates the diverging exceptions from mainstream outputs. The concept of NTRO blurs what is a research output that undergoes peer review and what is a physical result from a research process, what informs the research in terms of data or sources or what are documented elements of the research process. An artefact is manmade, with negotiable meanings and virtues. It is an ambiguous concept, as the term *artefact* in the field of natural science also refers to a mistake. We are aware of the possible misunderstanding in that the term *artefact* in the academic context usually refers to significant pieces like architecture, designed objects, paintings, or even intangible elements like music composition and performances. The artefactual is commonly juxtaposed with written or visual expressions. Possibly, the ambiguity of the concept may open up a discussion. Our interest concerns the functionality of the form for disciplined research communication and the discourse in which it is a product. The academic artefacts are important elements in the construction of academic meritocracy and are thus also vital for new fields to gain position and legitimacy. A scholarly discussion on this key topic is needed in the craft sciences.

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Video as a Tool for Knowing and Telling in Practice-led Craft Research

By Camilla Groth

INTRODUCTION

As craft practices have been taken up in academia, practitioner-researchers meet the challenge of articulating experiential knowledge of their practice. This position asks the researcher to first document and make sense of the experience and knowledge residing in their body-based craft practice, as well as transforming this experience into a format that is communicable to a wider audience. Video can be used as a tool in accessing this experiential knowledge, as well as in disseminating it. Outside the academic field, video is used extensively in online tutorials and presentations of craft-related knowledge and techniques. This chapter explores aspects of researching and disseminating experiential knowledge through an example of ceramic practice. It further gives suggestions on how video can be a useful tool to revisit experiences when used as an autoethnographic re-call of the situation of practicing. Video documentation further enables a slow and more detailed analysis of the events, that are often too rich in content to be noted in the situation of practicing the craft. Video recordings show the context of the situation and the multiple overlapping events and details that words may not capture. In addition, video clips in presentations of craft research have the ability to awaken the audience's possible previous experiences of similar events and thus bring about an illusion of a multimodal experience that point to the more implicit aspects of the situation. In the advent of online journals, there are now also possibilities to publish video recorded material as part of a research article, thus allowing for the implicit aspects of the practice to reach a wider audience. This chapter thus suggests the use of video in three aspects of craft research: 1) in documentation of experiential knowledge and events, 2) in the reflection on this knowledge and as an aid in accessing it, and 3) in the communication of the more implicit aspects of experiential knowledge.

As the practice-oriented fields have been accepted into academia there is a new generation of practitioner-researchers (Nimkulrat 2012) who now have the possibility to extend their practical knowledge through organised enquiry (Niedderer and Reilly 2010). In a practice-led research setting, the practitioner is both researcher and respondent, giving an insider's view on the practice that allows for the practitioner's own voice and knowledge to be heard. Practitioners in the context of academia are also obliged to transform their experiential knowledge into written form. In attempting this, the practitioner-researcher is faced with a number of challenges. Experiential knowledge relies on sensorial information that is situated, subjective, and often implicit and thus evades the explicit formulations that are required in academia (Biggs 2004; Strati 2007; Niedderer 2007; Niedderer and Reilly 2010; Nilsson 2013).

EXPERIENTIAL KNOWLEDGE

Experiential knowledge, also referred to as a-posteriori knowledge, is the kind of empirical knowledge we gain after having experienced something, usually through our senses or in an empirical experiment. When we have experienced something many times, we have learned to anticipate what will happen next time we encounter it. We are thus able to make sound perceptual predictions of this experience—it is now stored in our long-term memory and we have *embodied* the experience.

There are two types of long-term memories. The first is conscious and declarative. This type of memory helps us to store information and facts that may be recalled when needed, such as the recipe for a blue ceramic glaze. The other is the unconscious and un-declarative, and is also called the procedural memory since it stores procedures needed for doing tasks and performing actions, such as throwing a clay bowl on a potter's wheel. This is the kind of knowledge that craft practices are dependent on. Throughout their professional lives, craftspeople accumulate and store this procedural and implicit knowledge through the multiple and repeated interactions they have with materials, tools, and situations.

While crafts rely on a large knowledge base of facts and explicit theoretical knowledge, there is a large part of craft practitioner's knowledge that falls into the implicit and tacit dimension that evades verbal articulation as it is unconscious and not available to us in word format. The concept of a "tacit dimension" (Polanyi 1966) is an attempt to describe this form of personal knowing that plays such a large part in any practice field and that we have problems in distributing in our knowledge structures, in organisations, and in education.

While this is a clear challenge for researchers within craft research, there is yet another difficulty that practitioner-researchers are confronted with, and that is the problem of capturing and storing experience. Experience, in itself, is a discontinuous stream of experiences where moments of consciousness are replaced by new ones (Varela, Thompson, and Rosch 1991, 73). An experience is also not a physical thing that we may pick up and put in a box; this fact obviously makes experiences difficult to capture and store for analysis.

While the practitioner is practicing a craft, it is also very difficult to concentrate on anything other than the practice at hand, as most crafts need the

Figure 1: Potter's throwing wheel in rotation, as an example of the fast and fleeting nature of experience.
Photograph by Camilla Groth.

practitioner's full attention. Collecting data from the act of practicing the craft, while practicing, is thus another challenge. However, these difficult circumstances should not inhibit practitioners from researching their practice, and through the new generation of practice-led researchers, new methods and ways of studying practice, through practice, are emerging. The use of video-documentation in particular is one way of capturing and documenting events and related experiential knowledge.

HOW CAN WE USE VIDEO IN THE STUDY OF CRAFT PROCESSES?

The general nature of *practice* is time and space contingent, meaning that practices take place in events during a limited time frame and in a particular setting or context. As such, they share many notions of events where a performance takes place. The practitioner 'performs' the practice, thus the practitioner is a performer of sorts, whether there is an audience or not. To document such an event, a media that is suitable for capturing time and space-contingent

Figure 2: The video camera used for documentation of the studio-based case presented in this chapter.
Photograph by Camilla Groth.

data, such as the audio-visual format, is useful.

Video documentation (Figure 2) allows for a more detailed investigation of the events and the analysis can be conducted on many levels. Additionally, it is possible to verify and visualise emerging patterns of the phenomena found in the analysis through audio-visual evidence. Thus, video documentation and video analysis may add both rigour to the research practice and credibility to the research output.

Video has become a useful tool in the research on and through practice for teacher education (Geiger, Muir, and Lamb 2016) and sociological aspects of practice research (Whalen, Whalen, and Henderson 2002; Pink 2007; Pink and Leder Mackley 2012), and in eliciting aspects of experiential knowledge within craft (Wood, Rust, and Horne 2009; Almevik, Jarefjäll, and Samuelsson 2013; see also Hjort Lassen in this anthology). Additionally, in creative practices, design students' communication through gestures in co-design situations (Härkki 2018) and in visual ethnographic research on children's embodied learning through making (Carlsen 2018) has benefited from the use of video documentation. In particular, practices that rely on sensory experiences and the ephemeral aspects of capturing events that happen at a fast pace have utilised video documentation in the form of mobile-ethnography (Spinney 2011) and video-ethnography (Pink 2001).

As an attempt to point at possibilities offered by audio-visual media, I will in this chapter discuss my own research process on the practice of throwing clay on a potter's wheel. The research question here is: *How can we use video in the study of craft processes?* The examples presented in this chapter are drawn from my doctoral study, and therefore only serve to highlight the points I'm making in this text, as the actual research setting and the analysis drawn is already presented in previous articles (Groth 2015; Groth, Mäkelä, and Seitamaa-Hakkarainen 2015), and in my doctoral dissertation (Groth 2017). Therefore, the full description and the analysis of these research processes are not presented here.

In parts of my research, I video-documented my own practice and speech as I attempted to verbalise all my knowledge of the event at hand. I then analysed the video sessions by protocol analysis. I found that video documentation and video analysis were useful methods for revisiting my experiences and memories of the event, as they facilitated a video stimulated recall of the experiences. The video recording also enabled a slow-motion analysis of the events that were too rich in content to have been verbalised in the situation of making (see also Jarefjäll 2016).

In the next sections I will briefly present the research design and the methodology as well as describe the study I conducted. I will then show some examples of how video was found useful in documenting, reflecting on, and articulating practical knowledge, and I will discuss the process in relation to craft research. Finally, I will discuss how video may also be useful in transferring the more implicit dimensions of the practice situation to the audience of the research.

VIDEO AS A TOOL FOR REFLECTING ON PRACTICE

The methodology that I employed for my research draws on both artistic experimentation and methods used in general studies on practice in a more scientific approach. By combining these different approaches, I took the risk of diluting either one of the fields, ending up with a result that would not make sense for either the artistic or scientific audience. Nevertheless, I felt that an autoethnographic (Ellis and Bochner 2000) method that could come close to the lived experience of the craft was necessary, as was using the perhaps more rigorous methods for collecting data and analysing that have been used in, for example, design cognition studies (Cross 2001). However controversial, the intention was to reveal experiential knowledge in craft practice, thus the *artistic process* or *craft product* was not in focus in this research.

The attempt was done partly to better understand my own practice, but primarily as an attempt to theorise the practice for the purpose of advancing the practice field and related education. To achieve this, I employed a practitioner-researcher approach by creating an event in which I performed in a craft situation and studied my actions and related experiences. These experiences and events were then reflected on through the theory of embodied cognition—that is, a theory for understanding cognition as a result of the human-environment interaction, in which the body and sensory experiences naturally play a vital role (Johnson 1987; 2007; Lakoff and Johnson 1999; Newen, Gallagher, and de Bruin 2018).

As craftspeople predominantly use their hands during interaction with materials and tools, the sense of touch plays an important part in knowledge creation. Although haptic experiences are linked to all other sensory experiences, the haptic dimension is often overruled by vision, as attention often follows audio-visual cues (Gallace 2012). Therefore, eyesight can be seen as our dominant mode of perception (see also Pallasmaa 2005; 2009). In its immediacy and clarity, sight overrules the other senses and is linked to revelation and understanding; I see = I understand. Eyesight dominates even to the point that it blinds the body. However, when closing our eyes, we become more aware of our body and our haptic sense (Ingold 2004; Macpherson 2009; Vermeersch, Nijs and Heylighen 2011; Groth, Mäkelä, and Seitamaa-Hakkarainen 2013; 2015). The haptic modality is at work in most fields of practice and expertise, although usually only perceived as a background provider of knowledge (Gallace 2012).

So, in order to test if I could augment my haptic awareness and if this would make me more able to speak about my practice, I spent five days working blindfolded in my studio, throwing unusually large pieces of porcelain clay to further enhance the challenge of managing the task (Figure 3). I recorded one clay-throwing event daily with a video

Figure 3: Screenshot from a video recording while throwing clay blindfolded. Click the image to see the video if reading a pdf version, or scan the code or go to: https://youtu.be/bK8joRUlsjU. Photograph and video recording by Camilla Groth.

camera and I spoke out everything that I felt and knew about the situation. This method of recording "think aloud accounts" is a method developed by Ericsson and Simon ([1984] 1993) and has been used, for example, in design cognition studies to reveal the thinking of practitioners while they perform a design related task. Traditionally, the practitioners in such studies are research participants studied by researchers in research laboratories. However, by linking the method to an autoethnographic study, I brought this experiment into the studio space and made myself a practitioner-researcher.

During these five clay-throwing events, I collected multiple types of data from several sources (for a full description of the methods used, see Groth, Mäkelä, and Seitamaa-Hakkarainen 2015 or Groth 2017). As well as using a structured diary, I also filled in a contextual activity sampling questionnaire (CASS Q) before and after each throwing session. Activity sampling methods are developed within practice research and have traditions especially in research in occupational health and wellbeing at work or in study life (see Muukkonen et al. 2008).

Here (Figure 3) is a sample of one of the video recordings that I have also used in presentations of my research. It has been cut in order to show the chronological process of throwing a clay pot from beginning to end. Consequently, it is not focused on displaying the think aloud accounts. However, it gives a 'feel' for the practice and the concentration needed in handling the process when eyesight is not in use. This recording was made on the fifth and final day of my studio experiment.

After the events, I analysed the video sessions through protocol analysis. Doing so means looking at each second of the video separately and writing down in columns the action made, as well as what I said at that moment, if there was any speech. As

Figure 4: Screenshot from the video while conducting video-supported protocol analysis, looking at each second separately and noting what was said and what actions were made. Photograph by Camilla Groth.

I had been blindfolded during the event, I did not have any visual memories from the events of throwing clay (Figure 4); however, by looking at the video I remembered the different stages in the process very vividly and the video worked as a *recall interview* with the situation (Geiger, Muir, and Lamb 2016). The memories were felt in my body and I could more easily remember how the different movements and actions had felt at the time and why those actions were inevitable at the time.

The analysis process of the audio-visual data, including the think aloud accounts, was conducted in two parts. I first conducted the protocol analysis and explored the different categories of information to be found in the data. In the first analysis process, the thinking aloud accounts gave detailed explanations on what I was thinking and doing and why it was necessary to make those actions. Often there were not many possible actions available in order to maintain the successful conditions of the process.

After making notes on what actions I made and what I said in those instances, as is customary in a protocol, I felt that there was much more that I knew about the situation than what I had written down. I therefore felt the need to adjust the protocol and make notes also on the sensory experiences that I remembered from the event and added these as a third line of reflections on the actions in the protocol. Doing this would have been impossible without the video recording, which helped me capture and store the moments but also the felt experience of the events.

The two images below (Figures 5 and 6) show some extracts of what the protocols look like: the left column gives the spoken accounts; the middle

Think aloud accounts	Actions made	Reflections on actions
03:27 Better take some more speed not to make too big dents in just one part of the clay…	03:27 Reaching for the hand stick and turning up the speed.	03:27 The slow turning of the clay is too dangerous as the smallest pressure makes an indentation in the clay, more speed is needed.
03:33 ..as the wheel turns a full turn while I move the hands. Then I'm not going to make a swirl or a bump - OUPS! There is some loose clay in the surface.	03:33 Showing with the hand how the wheel turns.	
03:52 Probably the clay has been loosening up while I was taking a five minute break (between centring and starting to throw again.) Just from the added water from the sides.	03:47 Some loose clay comes off. Washing it off into the water bucket, taking more water and continuing to smoothen the clay out on the sides.	03:47 Some loose clay comes off and the hand almost gets stuck and pulled with the force of the clay, but the bit of clay comes off into the hand instead. Washing it off but it is sitting stuck to the fingers.
04:04 Some more clay coming off. All the clay that is coming off is of course making the amount of clay smaller and the pot becomes smaller as well. But I can't anyway use the soft clay for, for throwing so if it is going to come off then it's better if it comes off before I start throwing.	04:04 More clay stuck in the hand from the base. Washing it off and continuing to smoothen the surface of the clay and to press the sides down quite hard to make the base wider.	04:04 There is a soft layer lying like a wabbly sausage around the base of the clay, water has made it wet and it is not throwable but needs to be there to protect the inside clay from getting wet as well.
04:40 So seems like I'm a bit braver now.. than before. Maybe I lost respect for what I am doing, I should maybe take it a bit more easy and concentrate more, otherwise I'm going to start making mistakes.	04:40 Taking more water, and wiping excess water off the board.	04:40 After pressing the sides down quite firmly, feeling that it is going well but quite quickly, and while still feeling good also feeling a bit of remorse.

Figure 5: Text extract from the video-supported protocol analysis. The left column shows the spoken accounts; the middle column gives my own notations on what actions were made; the right column presents the reflection on the actions and the sensory experiences, which was added in hindsight. Image by Camilla Groth.

column shows my own notations on what actions were made; the right column presents the reflection on the actions and the sensory experiences, which was added in hindsight. I have marked some sequences in red and blue to make it easier for the reader to follow a certain happening or theme in the accounts. The red events are signs of problems or ways of detecting problems and the blue sections show aspects of metaphoric language use. The black parts mostly display attempts to understand the situation and to solve problems. The markings of the minutes and seconds also help in reading the notations and following the events in time.

There were often many overlapping or coinciding incidents that were too numerous to speak out, such as the condition of the surface of the clay combined with the softness of it and the movement of the shape on the wheel. Often, I was too concentrated on handling a difficult task to be able to speak to the camera at the same time as controlling the situation at hand. The protocol analysis gave me the possibility to rewind and play the video sections back and forth multiple times to catch all information. The accounts were often concerned with feelings and the feel of the material and how this affected my decision making in the course of the event—for example, when the clay was getting too soft and I knew there would not be much time left before the clay would not keep its own weight and decisions had to be made quickly on how the process could be successfully terminated.

The accounts were also useful in displaying the language used—that is, the metaphors I used to describe the experience of the material condition. For example, in the account above, marked in blue, I have noted the conditions of the clay and the ex-

Think aloud accounts	Actions made	Reflections on actions
05:12 I don't want to loose this piece now after centring it for…I don't know how long…maybe two hours or something. It would be such a waste.	05:10 slowing down the actions and taking more water to press the clay gently down from the top down to the sides.	05:10 The clay is nice and centred, I am on the right track.
	05:30 Taking more water and feeling the shape with fingers all spread out. Pressing down almost getting stuck and then adding more water again.	05:30 Taking more water and feeling the round shape with wet fingers all spread out.
05:38 Oh, I'm getting stuck…		05:38 The clay is behaving tricky, all wet and smooth on the surface but when pressing hard the wet clay peels of and gets stuck on the surface of the hand, making a friction between the hand and the clay surface.
05:43 I keep having to add a lot of water now.		
06.01 There is some loose clay and… this is anyway going to be the base so I don't want to have a bad base, of course.	06:00 Some more clay gets stuck in the hand. Washing it off and continue to add water and press clay down.	06:00 The clay that is now forming the baseline is too soft to make the base as it would need to hold up the whole pot.
06:19 I better take of the loose clay before the loose clay becomes the base.	06:19 Shaving the base of the excess clay. Then pressing the sides down to avoid the water from seeping in under the base.	06:19 The bulging edge is easy to press inside the sides so that the clay underneath shoots out and stops the water from seeping in under.
06:34 I don't want the water to take any place underneath the clay.		
06:41 It's funny, I'm kind of throwing on both sides now simultaneously. It's not something I would do normally I guess.	06:35 Holding both hands around the clay and moving the hands simultaneously from above and down the sides towards the base.	06:35 The clay is under the hands and feels like a pregnant belly that should not be pressed on too hard. But it needs to be reshaped so there is no way to avoid the pressing, but it needs to be done gently.
06:55 Or, I don't know what is normal anymore. This feels pretty normal now.	07:05 Taking more water and wiping the board clean. Throwing down in a long gentle push, one hand above and one hand from the side.	07:05 Something needs to move now, no sitting and waiting until the clay gets too soft from all the added water.
07:39 Actually moving the clay with one hand and feeling it, where it's going, with the other one, helps me to visualize the clay through my hands.	07:44 Taking more water.	

Figure 6: Text extract from the video-supported protocol analysis. The red events are signs of problems or ways of detecting problems and the blue sections show aspects of metaphoric language use. The black parts mostly display attempts to understand the situation and to solve problems. Image by Camilla Groth.

pression that the shape and softness of the clay "feels like a pregnant belly that should not be pressed too hard." There were also many links to the fear of losing the piece, meaning that the piece would collapse or would not be successful in some other way.

The thinking aloud accounts also showed the situations in which the speech ceased because of physical strains. There would be long periods of time where my speech was interrupted. For example, I would stop speaking when I was forcefully using my muscles and where I had to hold my breath to manage a task. There were also several occasions during which I was in a state of flow and where I forgot to speak anything at all.

In this first analysis process, I noticed that the situations where a challenge or sudden constraint was present were especially important as decisions on how to proceed were made in these situations. It was clear that the aspects of knowledge needed for decision making were present in these situations, and emotions seemed important for the decision-making process as they prompted making a change in response to the fear of losing the piece.

I decided to conduct an even more detailed analysis, now focusing on the instances of these critical incidents where emotions were surfacing the most. The technique of selecting this data utilised the *critical incident methods* developed by Flanagan

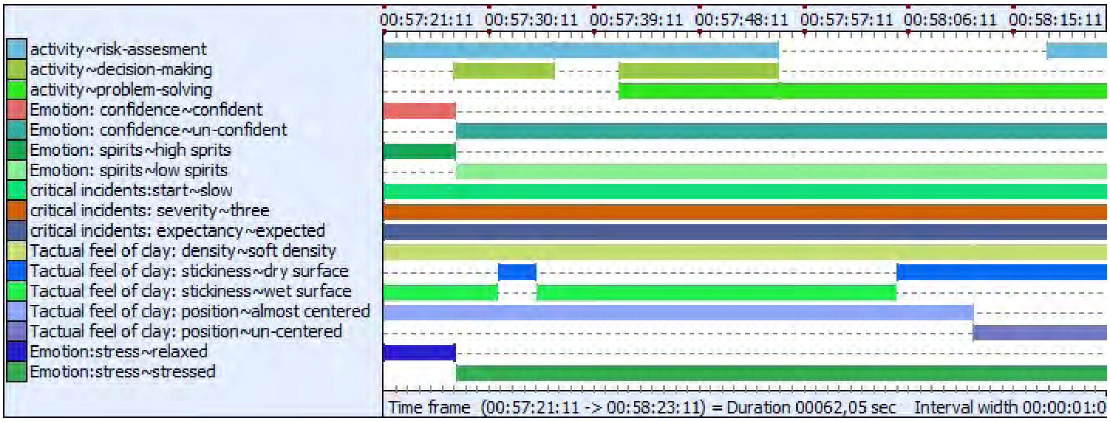

Figure 7: View from the analysis process on critical incidents using Interact. Image from Groth 2015, 14.

(1954) and which are used in the area of practice research-related occupational expertise and development of best practices. A critical incident is one that either has a positive or a negative effect on the outcome of an event, and, as such, affects or even determines the success or failure or the direction of events after the incident. In my case, the critical incidents were moments in the clay-throwing process when the clay became uncentred for different reasons, or when the properties of the clay changed, for example becoming too soft, making it difficult to proceed with the throwing.

In this second analysis, focusing on the critical incidents, I made use of a video-analysing programme called *Interact* that made it easy to tag and separate the parts of the video that included the critical incidents. I detected 23 critical incidents in the video data from the five days that consisted of 10 hours of recordings. The image (Figure 7) displays one of these critical incidents. This incident happened as a result of the clay getting too soft on the first day and the clay started slumping over itself as it could no longer carry its own weight.

While I was conducting the analysis, I noticed that some incidents were slowly emerging and others came quickly as surprises which I have rated on a scale of 1–3. They were also either severe or not so severe, also rated on a scale from 1–3. I tried to tag the conditions of the clay surface, wet or dry, and the density and position (centred or not) of the clay on the wheel. Additionally, I included my own experiences of the situation, my emotions, and what intentions I have in the process, such as risk assessment, decision making, or problem solving. The incident shown in Figure 7 was slow and expected and therefore the tagging of the incident starts when the piece is already getting beyond repair. The incident lasted for one minute and, here, the process was in the end terminated because of the problems emerging.

The programme allowed me to tag those snippets of video with different analytical categories that emerged from the data, and while doing this I could also refer to the protocol analysis from the same moment and listen to the related think aloud accounts that gave the explications on what was going on.

DISCUSSION

As explained earlier, I collected multiple types of data from the studied events. While analysing the CASS Q responses and especially when re-reading the diary notes I had taken right after the throwing events, I remembered what it was like to perform the tasks described in those notes. But none of these sets of data evoked my embodied and experiential memories like looking at the video-recording. As I was blindfolded during the events, I had no visual memories of the event, but the video gave me access to the visual aspect in hindsight. I could not have managed to undertake an analysis of the event only relying on my memory—I don't think it would have been as credible without being able to capture it somehow. But perhaps the most important aspect is that the video gave me access to the multiple events that were going on simultaneously—the actions, the environment, the think aloud accounts—and thus the ability to look at all the aspects separately. If I had not used video documentation, I would only have had written accounts and my memory of my experience to work with.

Capturing the Experience

If, as previously mentioned, human experience is a discontinuous stream of experiences where moments of consciousness are replaced by new moments of consciousness (Varela, Thompson, and Rosch 1991, 73), then this also makes experiences difficult to capture in single generalising words. When we try to verbalise experience, which normally involves all our sense modalities, in singular descriptive words, we have to pinpoint one single aspect of these discontinuous experiences, as we cannot grasp the whole at once.

Part of the reason for this might be that an action, compared to an articulation of that action, combines multiple types of information simultaneously. Neuroscientists Riitta Hari and Miiamaaria Kujala (2009) explain that nonverbal gestures and movements are difficult to describe since they contain dense and parallel information. Speech or written language is sequentially presented. Since humans typically carry out only one task at a time, dual tasks such as describing parallel information are straining our attentional capacity (Hari and Kujala 2009, 460). Similarly, it was impossible for me to talk at the same time as I was fully concentrating on a task that required my full attention. Not only did I need to hold my breath, but I could not 'produce' speech and focused actions simultaneously. In understanding and remembering what took place in an event, words in the form of a diary or an audio recording can help us in bringing back the experience through our evoked memories from the event. However, an audio-visual recording will give us the event as it happened, documented and stored, and available for analysis over and over again.

Mäkelä and Nimkulrat (2018) argue for the careful documentation of creative practice in practice-led research as they say that it aids reflection to be explicitly articulated in a form available at a later point for the practitioner-researcher to revisit and analyse. As a result, the practitioner may gain and develop understandings that can be shared within and beyond the practice field.

Reflecting-in-action and Reflecting-on-action

Donald Schön, in his book *The Reflective Practitioner* (1983), encourages practitioners to reflect in action and on action. By this idea, he gives away the understanding that knowledge related to practice resides in the moments of practicing (see also Molander 1993; Noë 2004). Practice situations can be very rich in events and, while concentrating on the practice in itself, it may be challenging to simultaneously take a distant view on the practice and analyse it (Borgdorff 2006). I personally felt that while acting in my practice I was just the practitioner trying to handle the challenge at hand and I could not take on the role of the analytical researcher in that moment. In this situation I could also not have distorted or manipulated the data in any way, as I had to be honest to my practice to be able to handle the events successfully. However, to be able to handle the complicated situation at hand, a natural reflection-in-action takes place, one that is intuitive and based on the ability to react to small hints and feelings of either opportunity or risk.

Only later, while looking at the data in hindsight, I took on the role of being a researcher. The transcribing process deepened the explicit understanding of the situation including experiences—such as orientation, temperature, sounds, wetness, stickiness of the clay surface, and muscle pressure—that would not be known to any other researcher than me. Thus, I was helped in noticing and writing down the different nuances of the events in hindsight. In this way, the video-documented data helped me to *see more* than I could possibly have done without it.

As autoethnographic and practice-led research have met some criticism of not being objective or rigorous enough (Pedgley 2007), I invited a colleague from the field of product design to co-analyse the video data with me to make the method more translucent and to add some objectivity to the analysis. We looked at the video data together and prepared ourselves to take notes—me on what she commented on that would be useful for my study and she on what aspects she found interesting or particular about the event. The exercise turned out to be frustrating for both of us, as from the very beginning the activities shown on the video seemed unintelligible to my colleague. The rest of the session was spent going through basic instructions for how to throw clay in general and after a while we both decided to give up the attempt of analysing the data together.

While my colleague could not help me in giving an objective input for my analysis, my own in-depth and systematic video analysis process helped me to understand many issues in my practice that were not known to me before as a practitioner. Having said that, the video analysis displays a breakdown of the events that is disconnected and not experienced as such in the natural conditions of the events. They might even be considered too manipulated or too separated from reality to be meaningful for the practice. The challenge is, of course, to put these pieces together again with the help of a theoretical frame to make them speak in terms that give us a new perspective on our practice. Embodied cognition theory was found to be useful in explaining how feelings and emotions work in different ways in relation to actions where we try to achieve or avoid some particular outcome of events (this discussion is published in Groth 2015).

Video Analysis Helps to Articulate Craft Knowledge

As described above, the video as a form of documentation allows for reflection on action in slow motion. It thus gives the practitioner a chance to ‘see more’ and to contemplate with the benefit of hindsight, especially in cases where talking during action is not possible because of physical hindrances and time constraints. But does it help in revealing the *tacit* aspects of the knowledge?

Through the concept of tacit knowledge (Polanyi 1966), it is generally accepted that experiential knowledge is impossible to express verbally. However, there are reasons to believe that the explicable part of craft-related knowledge may be larger than what has previously been assumed, when research on crafts has predominantly been conducted by non-practitioners. This is not to say that the concept of tacit knowledge should be redefined, but it may need to be revisited through the emergence of practitioner-researchers and the possibility of audio-visual documentation and analysis.

While we may not verbalise this knowledge, it can be seen through the enactments of the body and we can see how someone skilfully performs an action or procedure. Polanyi (1966, 5) himself suggests that if we want to communicate tacit knowledge, we have to "point" at it and rely on the receiver's "intelligent co-operation" in catching the meaning of the demonstration. My point here is that the knowledge that resides in a craft practice might become more available for analysis through the use of audio-visual documentation. Secondly, the dream of reaching for an articulation of the truly tacit dimension might not even be interesting, as I will argue below.

Design researcher Claudia Mareis (2012) criticises what she refers to as the "romanticized" discussion on the tacit aspect of practitioners' knowledge, in which it is insinuated that the craftsman possesses authority through the knowledge he alone has access to and therefore chooses silence (ibid., 70). Mareis further says that we should not take the unspokenness of design research as an apriorism but should consider the social dimension of tacit knowledge and treat the subject without romanticising it (ibid., 71).

I agree with Mareis that there is a romantic view of the craftsperson's knowledge as tacit and that it is a subject that is treated as something that, in a way, should not even be debated. While I agree that the very meaning of 'tacit' knowledge is to point at the undeclarable part of knowledge that we all possess, the border of declarable and undeclarable is difficult to pinpoint. I still think that the declarable part is larger than what is assumed by the discussion within the field of craft research (see also Ingold 2018). Additionally, audio-visual means which enable in-depth video analysis of events are much more developed today, including the low cost of digital reproductions and video analysis programmes.

In my experience of articulating my knowledge in relation to my doings and sayings during practice, I would point out that the statements that can be made during practice are quite mundane and don't at first sight look very interesting or useful. When there is enough of this data, and by analysing what goes on in detail, the notions of what goes on *between* the statements start to emerge, and this is where the more interesting phenomena start to appear. While the utterances do not work as instructions for another person, they give clues of what issues come and go in the flow of actions and what the practitioner is paying attention to.

The reflections that make a difference lie in the decisions that the more experienced practitioner has internalised and that have been embodied through the many previous encounters with the same or similar situations. I found that this knowledge first emerges as a vague feeling of something not being quite right which is followed up by searching for possibilities to avoid the emerging critical incident, or the feeling of opportunities lying ahead. I think that this prediction is the tacit knowledge of the craftsperson; it is the gut feeling by which the craftsperson navigates the situations intuitively by paying attention and reflecting in action.

Dreyfus and Dreyfus (1986) describe expertise as an ability to foresee events and to react to these at an early stage. If the tacit part of experiential knowledge is a *feeling* that guides evaluations and the informed decision making, it should be found in the emerging bodily experiences, feelings, and emotions of the practitioner, but may not exist in word format. If we play with the idea that we *would* be able to articulate the feeling-based intuition or gut feeling of what should be done next, then maybe we would be disappointed in how banal it would sound. Perhaps tacit knowledge would sound like exclamations such as: "Oh no, I knew it!" or "That's the way!" or "There is something wrong here…". Instead of looking for *instructions* of a tacit dimension, we could instead appreciate the explicit dimension that we *can* articulate and aim to extend and explain the meanings of these. This could very well be useful for our students and apprentices as they would need to know what kinds of situation they should pay extra attention to.

In any case, the silent craftsperson is only a romantic memory in the era of the internet and audio-visual technology. Outside of the sophisticated academic discussions on tacit knowledge, there is a growing discourse in the practice field where practitioners *do* articulate their practical skills fairly adequately. If practitioners on YouTube can articulate their craft-related knowledge and distribute it worldwide, then practitioner-researchers can too. Through the internet, practitioners of all dimensions are able to aid their verbal accounts with video footage from their studios, workshops, or presentations and they are in this way also able to show the context and multitude of actions in a way that supports the experiential nature of the activity.

Disseminating Experiential Knowledge Through Imagination and Empathy

In the presentations and lectures that I have held based on my doctoral study, I have usually brought one or two videos of my study into the talk. In feedback from the audience or the students, the video is usually mentioned as the most memorable and effective part of what I presented. This has been the case especially when the audience has had a link or personal experience in the field of ceramics, or if the person in question has tried throwing clay on the potter's wheel themselves. I have heard comments such as: "I felt like I was sitting there on that chair myself, having to control that large chunk of clay." People have commented that they felt anxious and scared that the clay would collapse and that they sometimes held their breath during the video clip.

I cannot control how people engage with the video or what they read into it, other than what I guide them to in the presentations. I'm also aware that each member of the audience reads different things into what I show them, based on their previous personal experiences. However, by showing them the context and the practice in action, I invite them to imagine the experience of the practice with me.

Even when only reading a text, the reader may *imagine* what circumstances are described in those situations. Practice researcher and organisational theorist, Antonio Strati writes about the "reader's imaginary participant observation" (Strati 2003, 69). He argues that the reader, through his imagination, may become a participant researcher, drawing on his own sensory-based experiential knowledge in the interpretation of the read text. Strati writes: "By virtue of participant observation conducted through the imagination, the readers see, hear, perceive and are aware of the research process in which they are imaginatively taking part through sensorial faculties rather than intellectual abilities" (ibid., 59).

This is a fundamental aspect in communicating with anyone since we take for granted that we share a common understanding of what we are talking about with the other person. If we have reason to suspect that they have no experience at all of the subject, we need to find ways to visualise the content more carefully so that they can imagine it instead (see also Sennett 2008, 179–94). We might use gestures, metaphors, or other means to describe a situation, and neuroscientists and linguists Gallese and Lakoff (2005) even present neuroscientific arguments for *multimodal language*, arguing that "[t]he same neural substrate used in imagining is used in understanding" (ibid., 456). The video of me throwing clay on a potter's wheel aids the audience in imagining "what it was like," even though they were not there.

In performance art, the use of video is recognised as a tool for nonverbal communication of the 'feel' of a situation. In her video lecture on her methodology, phenomenologist and dancer Susan Kozel (2013, 00:08:43–00:09:10) says "I needed a methodology that operated through resonances rather than through truths. This is to say my experience is not going to be held up as a truth to be mapped onto other people, across time and cultures, but it is to say that one person's embodied experience, when it is reflected upon, may actually open up meaning or resonances for other people." Kozel acknowledges the problem of turning a lived experience into academic writing but says that the lived experience does not necessarily have to be in word format—it may be a drawing or even a piece of sound. Kozel draws on the concept of affect that goes beyond feelings and involves impressions, intuition, memories, and imagination: "In theatre and performance we work on an affective level all the time. Affect is what is conveyed in between words or gestures, it is the unspoken" (Kozel 2013, 00:22:07–00:22:19). She goes on to say that video recordings may be used for *visual sketches*, as the camera has the potential to let you catch the affect or more liminal qualities of a situation (Kozel 2013).

As researchers we can try to engage our readers or audiences in our research, by drawing on their experiential knowing of materials and processes. While we cannot know what these are, we can introduce these to our audiences and encourage them to imagine our experiences as theirs (see also Pink and Leder Mackley 2012). As audio-visual media is encouraging emphatic behaviour, we could utilise this and draw on the audience's pseudo-haptic experiences, in which the visual representation is felt haptically due to the sensory expectation of such an input (Pusch and Lécuyer 2011). Pseudo-haptic experiences are connected to our brains' mirroring systems (Rizzolatti and Craighero 2004) and these in turn are thought to play an important part in empathising with the actor when observing an action (Gallese 2001). When looking at an action, our brains' mirroring system "fires" in the same way as if we were doing the action ourselves; our bodies mirror the action (Hari and Kujala 2009, 12).

Although experiential knowledge may be reflected on and even communicated through audio-visual means, that experiential knowledge described is best understood by a viewer who embodies that particular experience to some degree. Research on mirroring systems has found that neurons fire qualitatively more in situations where an action is familiar (Calvo-Merino et al. 2005). However, an audience who do not possess such experiences, or who are not keenly devoted to the practice described, might not find even the most in-depth analysis of a particular practice meaningful unless the results and contribution are lifted to a transferable level.

It is also clear that the audio-visual format is still a distant form of visualising the practice that does not convey *new* experiences such as touch, smell, or taste for someone who has not experienced these before in relation to the materials shown. Small details, such as small layers of paint flakes or particular shades of colour, such as the different colours of a hot flame, may be difficult to capture accurately. Having said that, I think that audio-visual documentation, video-aided analysis, and the use of audio-visual means in the distribution of practice-related research is likely to be of some use regardless of practice domain.

Spinney (2011) and Pink and Leder Mackley (2012) both promote the inclusion of videos in the communication of research (see also visual ethnography by Pink, 2001). This discussion links to the general discussion in the Arts that strongly promotes the inclusion of artefacts as part of research disseminations. The discussion on the contribution to knowledge carried by the artefact is lengthy (Biggs 2002; 2004; Mäkelä 2007; Niedderer 2009; 2013; Biggs and Buchler 2011), and the concentrated conclusion so far is that the artefact does not speak by itself but needs to be contextualised by the artist through some format. The possibilities of audio-visual media bring new dimensions to this discussion in relation to text-based publishing as online journals facilitate the inclusion of video links.

Furthermore, in the research on practices in general, experiential components are present and it is recognised that these are difficult to transfer into text (Niedderer 2007). In craft research especially, the outcome is not always a product or an exhibition but rather the progress or a moment in the flow of practice. Here, video clips could serve as a medium for showing the experiential part of the activity. Thus, it would also be necessary to include the experiential aspects of the practice in the dissemination of results in the field of practice research in general. However, few craft researchers use the full potential of audio-visual material in the dissemination of their research results.

The task is not as daunting as it has been since it has recently become possible to present practice-led or artistic research in online journals that allows for multiple types of media, for example text-based articles that contain links to videos of the artistic or practice-led work that the article is describing. The format enables experiential knowledge to be communicated and experienced in a completely different dimension than the merely text-based article. As such, it is also useful in research that explores activities and practices which naturally include experiential and tacit knowledge.

CONCLUSION

In this chapter I have shared some aspects of the role that video may play in knowledge making and knowledge dissemination in the field of craft and practice-related research. While not being able to authentically express experiential knowledge of a practice verbally, research on craft practice is helped by utilising data collection and analysis that includes the experiential component of the practice. Audio-visual media has a wide potential here due to its usefulness in capturing and documenting events that are time and space contingent.

In research practice *video helps to document and visualise the context, and multiple actions and overlapping events of a specific situation.* Thus, video documentation helps the practitioner-researcher in capturing the otherwise fleeting experience. *Video helps to investigate experiential knowledge through evoked bodily memory and slow-motion analysis after the event.* Thus, the use of video analysis offers ways of reflecting in action, as well as reflecting on action in hindsight. *Video has the potential to engage the viewer's empathy and previous bodily experiences, thus also disseminating experiential aspects of the practice.*

Insights from practitioner-researchers and the use of audio-visual media in journal articles adds to, and renews, the complex discussion on tacit knowledge. In conclusion, audio-visual means may be used along the whole research process, from data collection and documentation to analysis and reflection, as well as in the dissemination of both explicit and more implicit dimensions of the practice. The methods described here are likely to be useful across several practice-related domains and especially in practitioner-researcher settings.

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Ulrik Hjort Lassen is a master carpenter and holds a PhD in Conservation with a focus on timber framing. He has experience from many different traditions within the field of timber framing, and for ten years he has been teaching courses for the building crafts students at the department of Conservation in Mariestad. Hjort Lassen now has his own company where he builds new timber-framed constructions and restores historic buildings in the western parts of Sweden. He also teaches shorter courses for both beginners and experienced carpenters.

KEYWORDS: Craft, craft research, instructions, knowledge transmission, learning resources, mortice and tenon, skill, stolpverk, teaching, timber framing, video.

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Making Instructions: Developing Learning Resources in the Craft of Timber Framing

By Ulrik Hjort Lassen

INTRODUCTION

How is it possible to transmit the craft skills involved in timber framing when there is no longer a living tradition of building timber-framed constructions[1] in Sweden? The Swedish master-apprentice system was dissolved in the middle of the nineteenth century (Hantverksföreningen, n.d.), but timber frames were still built on a large scale, mainly for outhouses, until the Second World War. Because of the industrial development of materials and methods in the 1950s and 1960s, the role of the carpenter has moved more and more towards montage and prefabrication. The Swedish term for carpenter, *timmerman*, is now only used to refer to carpenters working with log buildings or restoration of historical buildings.

Today there is a growing sustainable movement, and this can be evidenced from the developing interest in small-scale building projects using unprocessed and locally produced materials with small environmental footprints. Historical building methods using wood require very little technology and when using locally produced materials these methods have very little environmental impact. The most energy is used by the carpenters themselves. Today most carpenters think to use machines first, although they are not always more efficient. In some situations, hand tools will be almost as efficient but they use less energy when considering the total environmental impact, including the manufacture of tools, the production of materials, transport, and the energy used in the building process (Craftlab, n.d.). The environmental consideration is also a reason why it can be important to transmit basic craft skills, basic craft knowledge, and use of low-technological methods, tools, and material.

I am a Danish carpenter and throughout the last fifteen years I have been studying historical working methods in timber-framed constructions. I took my Bachelor's degree in conservation, which was the reason for coming to Sweden, as this kind of educational programme was very unique and did not exist in Denmark at that time. After that, I worked as a PhD student at the Department of Conservation where I had the opportunity to learn different traditions within the field of timber framing, to build many types of constructions, and to use different types of tools and approaches (Lassen 2014). I have mostly learned by working alongside experienced carpenters and through practical 'learning-by-doing' situations. The field of craft research was new at the Department of Conservation and alongside fellow PhD students studying other crafts, I experienced the difficulties involved in describing or explaining working procedures. Often, this involved different kinds of gestures and sound effects in the dialogues and discussions between carpenters. To be able to analyse and describe working procedures at the executional level is an important part of craft research, and this is what I call procedural analysis (Lassen 2014, 37). What happens in the practical situation? As part of my PhD, I have also taught practical courses at the Department of Conservation at the University of Gothenburg, teaching students how to build timber frames. In this context, I have experienced the challenges involved when describing working procedures and have found that the most efficient way of teaching has often been to perform demonstrations. However, sometimes it is not possible to teach using demonstrations, and over many years I have produced a number of descriptions of working procedures in timber framing, both as an instructor and as a craft researcher (Lassen and Wood 2013). For the last five years I have had my own company, where I carry out restoration work and new constructions in timber framing. Alongside this, I have continued to teach two courses lasting several weeks at the University of Gothenburg and I also teach short courses lasting from 2–5 days in timber framing for both novices and experienced carpenters.

1. Introduction – what is timber framing, layout, tools, literature, exercises and presentation of the practical project.
2. Practical introduction in the workshop, hand tools, timber and exercises
3. Marking and sawing exercises. Cutting 5 pieces off a timber in square and exact measures (+/- 1 mm)
4. Wooden joints – mortice and tenon
5. Wooden joints – pegs and drawboring
6. Working methods and procedures
7. Working environment - ergonomi, how to lift and move heavy timbers.
8. Lining not perfect timbers - reference lines.
9. Wooden joints – scarf joint (blixtskarv)
10. Wooden joints - producing symmetrical wedges
11. Wooden joints – corner joint (snett blad)
12. Practical work in groups – building a timber framed trestle
13. Theory in groups – types of timber frames, terminology, literature search.
14. Sorting and grading timber
15. Measuring and cutting timber
16. Production of a timber framed structure
17. Introduction to machines – kettenstämmer, circular saw, band saw among others.
18. Statics in timber framing
19. Visiting historic timber frames
20. Developed drawing - basic
21. Timber framing repairs
22. Seminar – types of timber frames
23. Practical and theoretical examination

Figure 1: The structure of the course *Stolpverk 1* from 2016.

The two courses, *Stolpverk (Timber Framing) 1 and 2*, of four to five weeks have been developed at the Department of Conservation over the last 20 years, and according to the internal course evaluation conducted by the department, the courses are highly appreciated by the students. Across the two courses, we[2] have developed a structure which includes most of the important aspects of timber framing for a beginner within the craft. This involves an introduction to the field, the development of complications in exercises, and the balance between practice and theory (see Figure 1).

However, there was no updated Swedish learning resource within the craft of timber framing and the resource we have used until now, Byggnadskonstruktionslära (för timmermän) (Hermods-Korrespondensinstitut 1922), is now 100 years old. We have also used a book from the Danish carpentry school, Træsamlinger og lette konstruktioner (2003), and books on timber framing from the United States[3] (Sobon 1994; Benson 1995; Chappell 1998; Beemer 2016). The learning resource dated to 1922 contains most aspects of the world of carpentry from that time, such as practical geometry, wood species, and joint types, but the resource was created for carpenters and not for novice learners. There is no explanation of tools or procedures for marking or cutting, perhaps because this was all common knowledge among carpenters in 1922.

In the Danish and American learning resources, the use of hand tools is well described and illustrated (see Figure 2), but there is a general lack of explanation as to why these particular methods are used and often there are no references to other possibilities. Here, neither the described type of construction or the tools used correspond to the Swedish tradition of timber framing, and so there is a need for developing a Swedish learning resource which can be adjusted to suit education in practical situations and to the world of today, where students generally search for knowledge using digital media.

Recently, I have been working on turning *Stolpverk 1* into learning resources for novice learners in timber framing, which should be applicable in practical teaching situations at vocational schools when the practical hands-on situations are not a possibility. It is now published in an instructional book *Bygga i stolpverk* which was recently published by the author of this article (Lassen 2021). For the purpose of this present chapter, it has not been possible to include mention of all of the different parts of the course used in the learning resource, so I have chosen one specific exercise for demonstrative purposes. One of the first practical exercises is to make a mortice and tenon joint, which is one of the most common joints in timber framing (see Figure 3). This exercise involves layout and marking, exact cuts with a hand saw, a chisel, and a mallet, and drawboring for the peg. The method in this case study has been used when developing the learning resources for the above mentioned book.

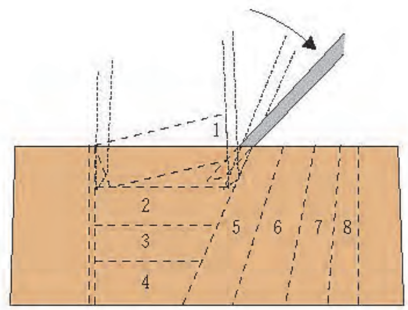


Figure 2: Illustrations from the Danish learning resource, *Træsamlinger og lette konstruktioner* (2003, 52).

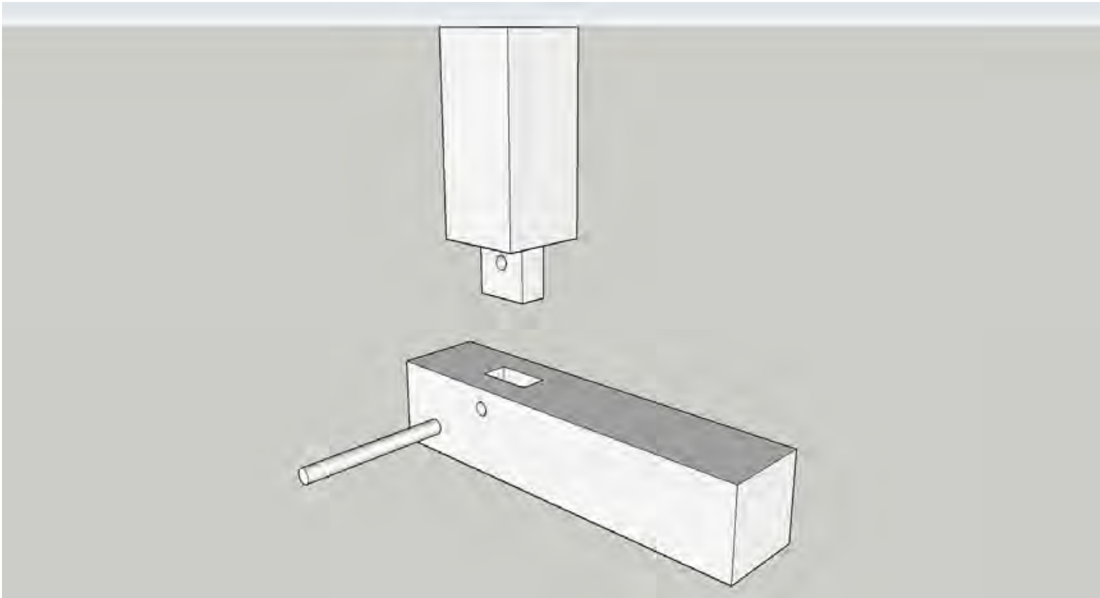


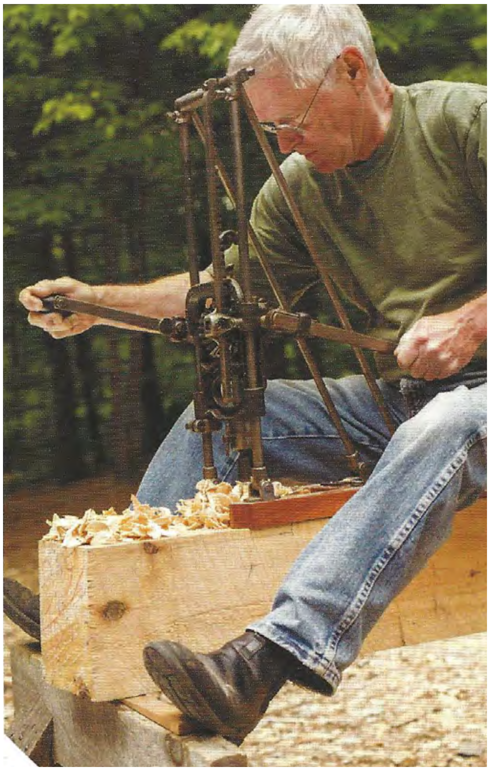
Figure 3: Animation of the mortice and tenon exercise. Click the image to see the video if reading a pdf version, scan the code to the right or go to: https://youtu.be/Tgk1s3zaxrU. Animation by Ulrik Hjort Lassen.

The aim of this study is therefore to develop a video-based learning resource of the cutting procedures involved in this specific exercise. Both practical and theoretical levels of knowledge should be included, balanced, and combined. Questions to consider are: *How to get into my own practical knowledge? How should the working procedures be described? How are illustrations, text, and video to be combined to create appropriate learning for novice learners?*

DIFFERENT METHODS AND APPROACHES

I am a Danish carpenter, so, unsurprisingly, my way of cutting the mortice is very similar to the procedure described in the Danish learning resource using only a framing chisel and a mallet (see Figure 1). This is illustrated by five illustrations, a simple but very efficient two-dimensional line drawing, a photograph of how to sit on the timber, two 3D drawings, and one drawing of an arm and a mallet (Træsamlinger og lette konstruktioner 2003, 52–53). Other descriptions of cutting a mortice are found in American literature, where the mortices are often bored with an antique boring machine first, before the chisel is used (see Figure 4) (Sobon 1994, 85; Beemer 2016, 64). This is indeed a very efficient approach, but this boring machine was developed in the USA in the nineteenth century and has, as far as I know, not been used historically in Sweden.[4]

In many historic constructions it is possible to find traces from an auger in the bottom of mortice holes (in some situations the round cut from the drill has been left in the mortice and the ends of the



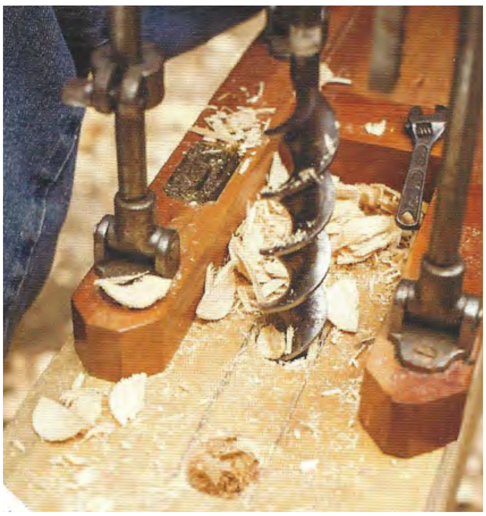


Figure 4: Illustrations from Will Beemer's book, Learn to Timber Frame (2016), where he demonstrates the boring machine when making a mortice.

tenon have been rounded instead). This is also an efficient and attractive approach, especially when cutting a mortice in a knot or in dry wood. There are other historical tools, such as the mortice axe (German: *kreutzaxt*), the French *bisaigüe*, and the Norwegian *hålyxa*, which are all suitable for making mortices, but which all take more experience to use, with the mortice axe being fairly dangerous.[5] Furthermore, special tools such as the corner chisel or the swan neck chisel can ease the procedure a little by cutting the corners or cleaning the bottom of the mortice, but I have never seen these used historically in Sweden (see Figure 5).

On YouTube, there are many descriptions of how to cut mortices for furniture or doors/windows, which are smaller than the mortices in timber framing. But the way of demonstrating the procedure on video is what is of interest for this study. An interesting method used by Paul Sellers is to use a plexiglass as one side of the mortice, which allows the viewer to see what is going on inside the mortice when cutting (YouTube, Paul Sellers 2012). This is an interesting way of developing the learning resource, but it was considered more important in this study to demonstrate the actual situation of the exercise in the instructional video on the cutting procedure.

MAKING LEARNING RESOURCES

To make learning resources is a field of research in itself, and there is a great variety in the approach irrespective of whether the subject is mathematics, psychology, or cooking. The way of describing a procedure also depends on the level of experience of the learner. In practical, personal, or procedural knowledge, important parts are often tacit and, as such, are hard to describe in words (Polanyi 1966; Rolf 2017, 51). Furthermore, it is a challenge to generalise this kind of knowledge because in most

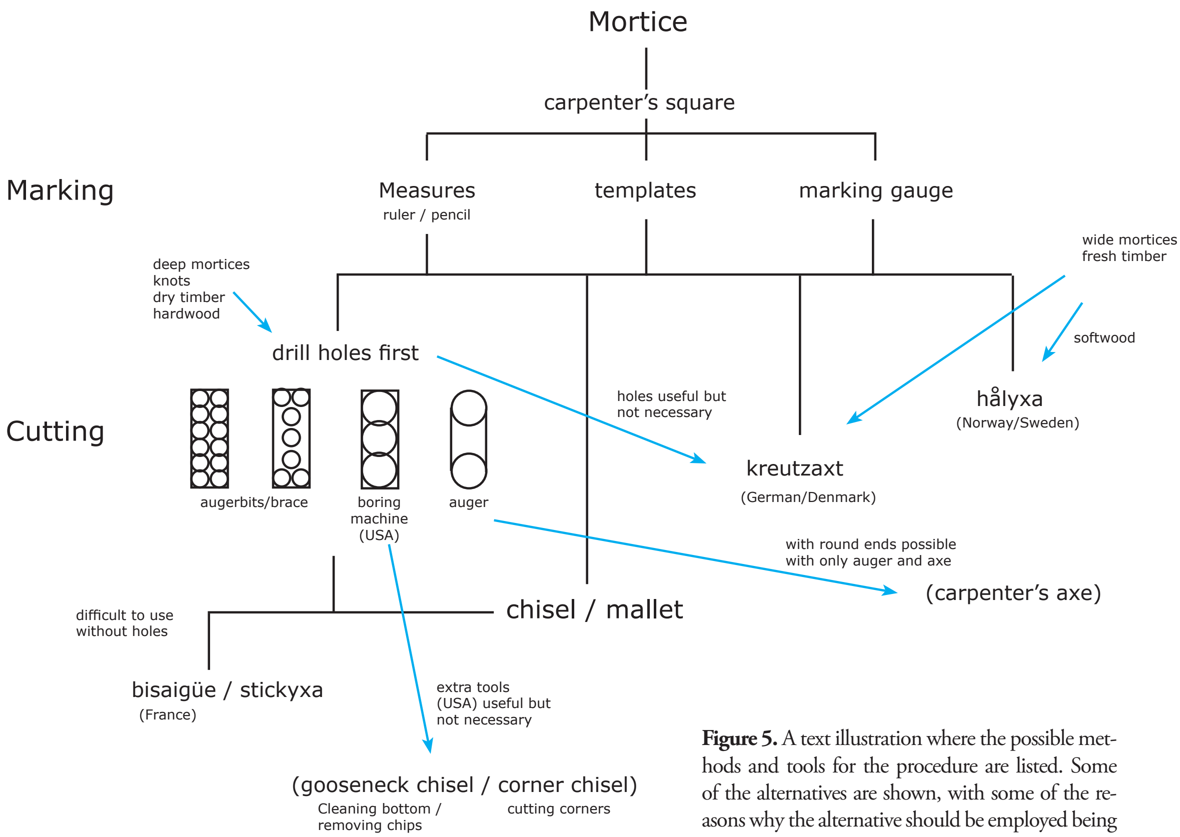


Figure 5. A text illustration where the possible methods and tools for the procedure are listed. Some of the alternatives are shown, with some of the reasons why the alternative should be employed being presented. It is, however, difficult to generalise this knowledge. Text illustration by Ulrik Hjort Lassen.

cases it is very situation-specific (Archer 1995, 12; Lassen 2014, 39). A result of this is a general lack of detailed descriptions of working procedures within crafts. In an earlier study, I made a multimedia learning resource of a layout and marking method, *plumb line scribe*, which is a complex system for marking the timbers for timber framing (Lassen and Wood 2013). This study showed that the transmission of craft knowledge is eased by making multimedia learning resources with paper-based procedural descriptions using simple line drawings combined with video material, which corresponds to the procedural description (Lassen and Wood 2013, 38). In that study the actual cutting of the joint details in the timber were not included in the learning resource. This part of the process is more active and the way of describing the procedure is therefore different: the practical knowledge is even more bound by the physical actions when cutting than it is when marking.

To cut a mortice and a tenon is a rather simple exercise for an experienced carpenter, but to make a procedural description of how to do so is not necessarily a simple task. To describe working procedures without being able to demonstrate them through physical action requires many words. Of course, this depends on the exactness in the description, and it is almost impossible to include all aspects of a situation in such a description. In the 1922 Swedish learning resource, such a description would have been

Figure 6: Video sequence of me teaching, demonstrating how I cut a mortice. Click the image to see the video if reading a pdf version, scan the code to the right or go to: https://youtu.be/cBSERnzhn2Y. Video by Ulrik Hjort Lassen.

that the mortice is preferably cut with a framing chisel and a mallet and that the tenon is cut with a cross cut saw and a rip saw or an axe/chisel. But, of course, not even this information can be found here (Hermods-Korrespondensinstitut 1922).

Throughout the last 10 years I have experienced students struggling with making a mortice with hand tools, and they spend more than an hour on this task, even after I have demonstrated my way of working (which takes a maximum of 10–15 minutes). This has made me realise the importance of demonstrations and even more so the continuous guidance needed in the learning situation. I have myself experienced describing the same procedure in three different ways to different students, depending on the level of skill of the students. As it is not always possible to be present for the students, to make a video-based procedural description of the procedure is considered an interesting way to enable the students to study the working procedure several times.

The procedural description in this study is mainly based on my own practice as a carpenter and on my experience as a teacher. The first step in making the video-based procedural description has therefore been to find out how I 'do' myself. The second step has been to study other methods and the different possibilities within the method (for example, the types of tools used and alternative methods). The last step has been to produce an instructional video of the procedure, which is followed by a procedural description, where both of these are to be used in the final learning resource.

HOW DO I 'DO' MYSELF?

Of course, I have a good idea of how I cut a mortice and a tenon myself. However, to be able to describe each part of the procedure—when I do something, how I do it, and all the small decisions that I make during the process—it has been necessary to make a procedural analysis. Video has been successfully

Nu tänkte jag att visa lite hur jag huggar ett tapphål, för det här kan ni ju. (Haha). Orkar ni? –menar då tappdelen också. (Jatack! Man skulle ha haft en kopp kaffe.)
2.17: Gör biten fast i motsatt ända med tving. 2.45: Börjar att såga bröstsnittet. Pratar om att en grovtandad såg är lite svårare att starta, men annars är det ingen stor skillnad. Jag sågar från ena sidan och ned och när jag är nästan nede håller jag koll på båda sidorna, kollar 2-3 gångar på motsatt sida. 3.15: Borstar bort sågspån, och tänker vända på virket. Kommer på att jag i stället vill visa hur man huggar bort materialet med stämjärn och klubba. 3.29: Tar kantarna först och huggar sedan bor nästan till linjen. 3.47: När jag sedan skall ta inne vid bröstet på tvärs av fibrarna, ligger inte timret fast, och jag behöver ta en tving till.
4.05: Jag tar linjen med stämjärnet och startar inne vid bröstet och vinklar stämjärnet lite utåt och tryckar det längs linjen, medan jag håller vänstre handen på virket. 4.09: bytar ställning och trycker stämjärnet ind längs hela bröstet. Vinklar lite i början (kanske) och jobbar sedan utåt. Kollar linjen i ändan att det blir bra. 4.25 klart.
Säger att det kan ju verka lättare att göra såhär än att såga det. Vad tycker ni? (ja, jo, men?) Vänder på virket. (det beror väl på strukturen i träet?) Ja absolut, är det en kvist är det inte så roligt att hugga det. Och går fibrarna nedåt är det inte häller så lätt.
Man kan använda en yxa i stället. Men jag hade glömt att såga bröstsnittet först. Man skall akta sig för att det inte går för snabbt. Tar en annan och mer grovtandad såg till nästa snitt. 5,27: igen lite svårt att starta. Sågar på samma sätt som för. Kollar 3 gångar. 6.07: huggar bort med yxa och klubba. Här är det lite mer vridigt. Slår i ändträet först, ligger på knä framför, och sedan resar jag på mig och vinklar yxan lite uppår. Sedan huggar jag inne vid bröstet för att få bort material. Tar yxan och tryckar på tvärs av fibrarna. 7.06 funderar lite på nästa steg. Tar fram fintandad såg, men måste vända på tvingen först (någon hade ställd den åt fel håll (!). 7.25: Sågar kortsidorna av tappen. Först med en hand och sedan byter till två händer när jag sågar vertikalt. Vänder på mig. Hur noga är det egentligen? Huggar bort md yxa och klubba. Fibrarna går lite åt fel håll. Putsar med yxan. 9.00 Nu kan man kolla lite grann om den bular ut härinne vid bröstet. Gör den det är det bra att ta det nu, och huggar bort med yxa och stämjärn. Sedan kan det betala sig att fasa tappen ganska rejäl fasning och det är lite jobbigt att ta undersidan nu, så det brukar jag att göra med en gång. Jag kollar tappen 80,5 mm lite väl stor… jag tar sidorna lite med stämjärnet då går den lite lättare in. Sedan mäter jag bredden på tappen.
I stället för att göra det här är det någon som har kommit på att göra en tappmall, och den går inte på, därför tar jag lite mer på tappen och tappmallen går på. Tappen klar. Tar bort tvingerna och bytar till tapphålsdelen.

Judgment of the timber, best corner.
- *Avoiding nots/cracks and rounded surfaces.*
- *Choosing best corner and reference sides.*

Measuring.
- *Putting on the exact lines in 90 degrees to the best corner*
  - *Length measures and marking on the best corner.*
  - *Squaring off from the best corner.*
- *Placing the mortice in the center of the joint.*
  - *10/100 mm from the one face of the post*
  - *40/40 mm from the other face*
- *Marking the tenon*
  - *10/100 mm from the one face of the post*
  - *40/40 mm from the other face*
  - *80 mm in length (ca 4/6 of 125)*
- *Marking the chisel with 85mm*

Cutting
- *Marking with the chisel round the mortice*
  - *Small bits of the mallet starting with the ends ca 5 mm from the line (2-5 mm deep) and along the lines at the sides.*
- *Cutting the mortice*
  - *Starting in one end and working down. Chipping off 5-10 mm each time. Working all the way down till the marking on the chisel.*
  - *Turning the chisel and working off material till the other end (5-10 mm)*
  - *Slicking the sides of the tenon with the chisel and control ling the direction of the sides of the mortice (combination square?)*
  - *Cleaning the bottom - Cutting off the chips in the bottom by twisting the chisel, checking that the depth is ok all the way (combination square).*

Figure 7–8: A small part of the text that I wrote to articulate the actions in the video, and to document my comments. This part is about cutting the tenon (in Swedish). Figure 8, the step-by-step description written out in text. There are quite a few steps involved and the whole procedure with mortice, tenon, and peg will last for about 25 minutes.

used by other craft researchers as an important tool to analyse working procedures (Jarefjäll 2016; Groth 2017) because the video catches procedures as no other media does, and "allows for a more detailed investigation of the events and the analysis can be conducted on many levels" (Groth, 51, in this anthology). To be able to analyse my own working procedure, I have recorded video sequences of myself in action in two similar but different situations.

The first is in the educational situation where I make demonstrations to the students. In this situation I demonstrate my way of working while I talk aloud to the students about what is going to happen and why I perform specific movements (see Figure 6). Here, I even chose to show two different ways of cutting a tenon on the same tenon, to demonstrate that there are different possibilities (maybe this was not the best pedagogical approach for novice learners, but I believe that more experienced students will understand both possibilities). In this video I have been able to record some comments from the students during the demonstration, as the camera was placed among the students. This provides an insight into the reactions of the receivers of the demonstration.

In the second situation, I have recorded video sequences of my own practice, where I just try to work efficiently, without stopping and explaining. This gives me an idea of how long the different steps take in relation to each other. I have also used the concept of "thinking aloud accounts," which is a method originally used in design cognition tasks, but which has also been applied in autoethnographic research (see the respective chapters by Groth and Seiler in this anthology). Here, I was talking to myself as if explaining what I was doing to somebody else, but without slowing down in the process (as I normally do when I demonstrate for students).

I have watched the videos and tried to write down what I do and what I say (see Figure 7). When forcing myself to write about what I do, I have been able to point out specific movements and approaches that I had not realised were things that I was doing. An example of this is that I loosen the grip on the handle of the chisel just before I hit it with the mallet. On reflection, I do this to avoid the force of the stroke hitting my hand, as it can hurt, but this comes very naturally after you have hurt yourself a few times, and I have never really thought about it before watching the video. To put into words what you see and do is an important tool in procedural analysis (Lassen 2014, 38), and together with the thinking aloud accounts it has helped me to delve deeper into the procedure. From this I have started to separate the procedure into different steps. These steps can be considered as the first version of the paper-based procedural description (see Figure 8). Once I know how I 'do', I am able to define how I want the video to be, which steps are most important, and what to show when and how. I have then prepared my procedure and tried to make an instructional video of the working procedures separated into different steps.

SITUATION-SPECIFIC KNOWLEDGE

As mentioned above, the approach used to solve this specific situation, to cut a mortice, is based on my way of working. Other approaches will work just as well, or maybe even better, but this depends on the specific circumstances of the situation. To describe these circumstances, it will be necessary to answer the following questions. *What is the experience of the craftsperson? How many mortices are to be cut? What are the conditions of the tools? What are the dimensions of the mortice and tenon? What are the conditions of the wood?*

One example of situation-specific knowledge in action can be seen in the complications of knots in the timber. If there is a knot in the mortice it is more difficult to cut, and it might be better to first drill holes to remove material before using the chisel and mallet. Furthermore, when the timber is dry, drilling holes can be preferable, as the timber is harder to work and it can almost feel like the chisel is chewing when cutting the wood fibres. But how many holes to drill and how to place them also depends on the dimensions of the mortice. Sometimes there will also be a knot on the side of the mortice timber, and this could cause the joint to become weaker because the wood fibres are diagonally crossing the edge of the timber and will split from too much tension. This is not even to mention the situation with cracks or knots in the tenon. The last two described situations are examples of structural failures in the joint, which should be avoided when building timber frames (Newman 2005, 115), and this is important to know about and to possibly avoid when creating the layout of the joinery on the timbers.

There are a number of different situations which might occur when working with wood. An experienced timber framer would be able to make a quick diagnosis of the situation and choose an appropriate approach for solving the issue (Sjömar 2017, 114). In some cases, it might be desirable to change to another approach such as drilling holes, but in my experience it is possible to solve almost all of these situations (cutting mortices) with a sharp framing chisel and a mallet.

When making learning resources for beginners, it is not possible or even desirable to consider all situations and potential complications when describing a procedure, as this might confuse the learner and lead the attention away from the specific action (Wood 2006; Westerlund 2017, 196). In this case, the choice of tools and methods used also aims to allow the students to become acquainted with specific tools and how they are used. It is possible to include more examples in the same instruction (Westerlund in this anthology), but the extent to which the level of difficulty should be increased depends on the experience of the receiver. The more experienced the learners, the more complex situations can be considered and other kinds of tools introduced (Lassen and Wood 2013, 45).

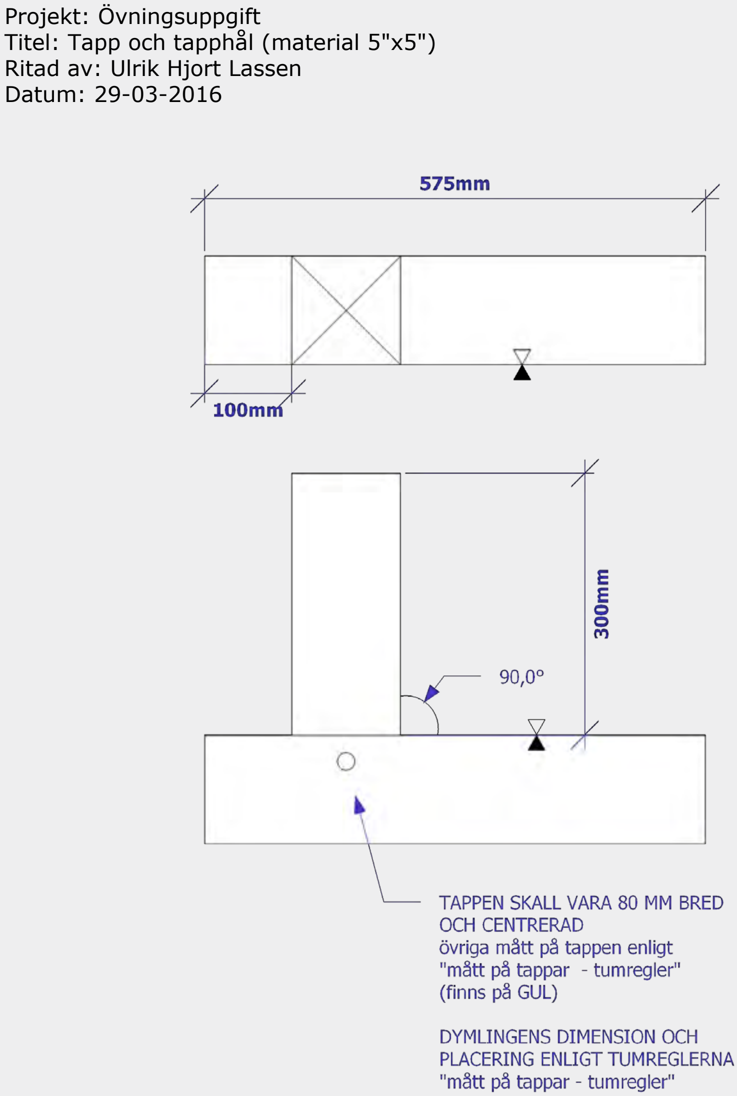
DESCRIBING THE SITUATION

In an academic context it is important to describe the circumstances of the situation in order to be able to evaluate and discuss the result, although much of this will be rather technical to non-carpenters. For the practical understanding of the situation, it is also important to define and describe the tools and the conditions of the wood—to describe the situation that has to be resolved.

The timber used when recording the video is mill-sawn Swedish pine, *Pinus sylvestris*, which is not too dry.[6] It is not too dense (1–3mm between the year-rings), it has rather straight wood fibres, and there is both heartwood and sap wood in the timber. The dimensions are five by five inches (ca. 127x127mm). The parts of the timber were purposely chosen without obvious flaws, such as knots or cracks. The layout method is square rule without reductions—also known as mill rule (Lassen 2014, 111).

The joint design is based on the exercise we have used for the students for more than 15 years. The dimensions of the tenon are 40x100x80 mm[7] and the mortice is made 5 mm deeper (see Figure 9). The peg is 19 mm (3/4”) and the peghole is drawbored at 2–3 mm to make the joint as tight as possible. The peg is made of pine heartwood and is planed to fit octagonally into the round peghole. In this case, it should fit tightly but not too tight, which means that there is enough resistance that it doesn’t slip in and so that you do not have to hit the peg too hard so it ends up cracking. The sound of the peg going in is also very specific and changes the further in the peg gets, as the tone gets higher. When you have pegged a number of joints, you will know the good sound from the bad. This kind of sensory experience will be addressed in the next part.

The trestles are heavy and very robust, specifically made in timber framing for timber framing (building a trestle is a task taught later on in the course) and two heavy work clamps are used to keep the timber still when working. The tools used in the exercise are: a carpenter’s square, a ruler, and a carpenter’s pencil for marking (see Figure 10); a German 28 mm heavy duty framing chisel and a well-used round Danish beech wood mallet (1150 g) for the mortice; a new Bacho cross cut saw (277 7T/8P - 550mm) and an old Orsa rip saw (progressive teeth - 650mm) for the tenon, both of which can be re-sharpened; and an antique drill with C.I. Fall auger bits, a wooden bench plane, a wooden template for planing the peg, and a heavy hammer for the pegging.



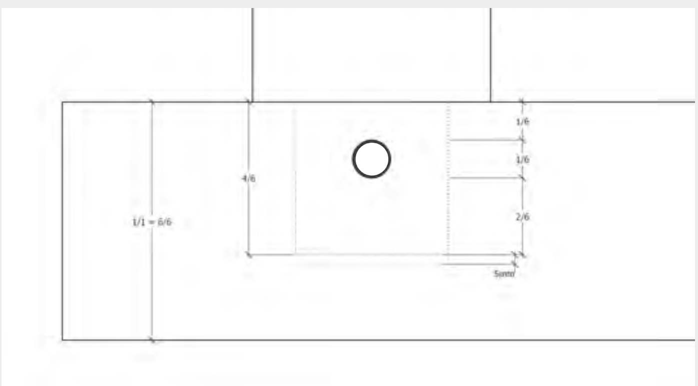


Figure 9: A) The exercise used for the students. B) Rules of thumb with measures for the tenon and peg. Text Illustrations: Ulrik Hjort Lassen.

Figure 10: The tools used for the video-based learning resource with the finished exercise in front. Photograph by Ulrik Hjort Lassen.

REPETITION AND SENSORY EXPERIENCE

To perform a specific task many times is an important part of learning craft skills, and in the master-apprentice system repetition has always been very important. Historically, carpenters usually started their careers as apprentices, where they were put on the most simple tasks in the beginning, such as carrying timber, sweeping the floors, or running errands. Slowly they would be given more complex tasks until the master was content with the result. This often meant that they repeated the same procedures over and over again, until they did them well (Molander 2015).

When talking about procedural knowledge, to do a thing well often means that the action is incorporated or internalised (Polanyi 1966). You do not have to focus on all of the details in the procedure when working. You know how to do it and when doing it you can react if something is not working as you want it to. To reach this point, to incorporate a procedure, it is necessary to repeat the procedure a number of times (Dreyfus and Dreyfus 1980; Rolf 2017, 51).

As an experienced craftsperson, the tools used turn into a prolongation of the fingertips when working, and you can somehow feel the condition of the wood through the tool when cutting. This can be defined as a kind of sensory experience of the practitioner, which can be compared to the way a painter recognises the properties of linseed oil paint by using their different senses (Källbom in this anthology).

This kind of sensory experience in timber framing is developed by repetitive actions. It is clearly possible to hear when a rip saw is sharp and cuts well, and when it does not, and to hear when the peg you are inserting into the peg hole is fitting properly or not. Nobody ever told me about this.[8] To develop this ability, you have to make many cuts with both sharp and blunt saws to get to know how it feels and how it sounds, and, furthermore, to be able to judge the result. Another example is when you cut a mortice with a chisel and a mallet and you feel that the chisel 'bounces' and doesn't really cut, which can be caused by a lack of support directly under the timber. A third example is when, finishing a tenon with a chisel, you can feel that the fibres of the wood are not cooperating and that you will have to turn around and cut from the other side. How do you explain this? It is very difficult to describe these sensory experiences in words. But, as a teacher, it is possible to demonstrate and to show these things in the practical situation, and for the student to actually see and hear how an action is performed is a very useful and educational tool for transmitting craft skills (Lassen and Wood 2013).

In the vocational schools, for logistical reasons, it is often not possible to get enough repetition in educational situations, and therefore it will be valuable to use video-based instructions so that the students will be able to watch the same actions over and over again using tablet computers or smart phones while they are on the work site. However, it is important to notice that the haptic dimensions are often overruled by vision, as eyesight is our dominant mode of perception (Groth in this anthology). The best way of learning must still be through repetitive actions. This is one of the challenges of the system for the vocational school and in using video-based learning resources, rather than using demonstrations and active guidance.

VIDEOING

Video has been used as an analytical tool with a focus on how to obtain good documentation of the working process. To make a video intended for publication, however, is something different. It is a craft in itself, where writing the manuscript or making the storyboard is only one part. How to capture a good sound, establish the right light conditions, and catch the right movements are difficult tasks for a novice (like me), as is the filming and editing necessary to produce a watchable video.

Of course, the amount of work put into filming and editing depends on the quality of the final result. In this case, the video quality when recording how I make the joint has not been of great importance. But the final result, the video-based procedural description, should preferably be of reasonable quality. In order to catch both the situation and the details, it was necessary to use two cameras at the same time, and this makes both filming and editing even more complex. The advantages of video in the documentation of working procedures now becomes a challenge, as the audiovisual media catches much more information than you might necessarily want to show (e.g., background noises), and this extra information might confuse the viewer of the video.

When the focus is on making learning resources, the most important aspect of this process is to capture the actions and to demonstrate how to 'do', how to hold the tools, with how much power to hit the chisel with the mallet, or which angles to hold the chisel at. The aim is that inexperienced viewers will get enough information to learn the procedure properly while keeping the attention on what they have to learn. Furthermore, the idea is also that more experienced viewers of the film will be able to notice other aspects of the working

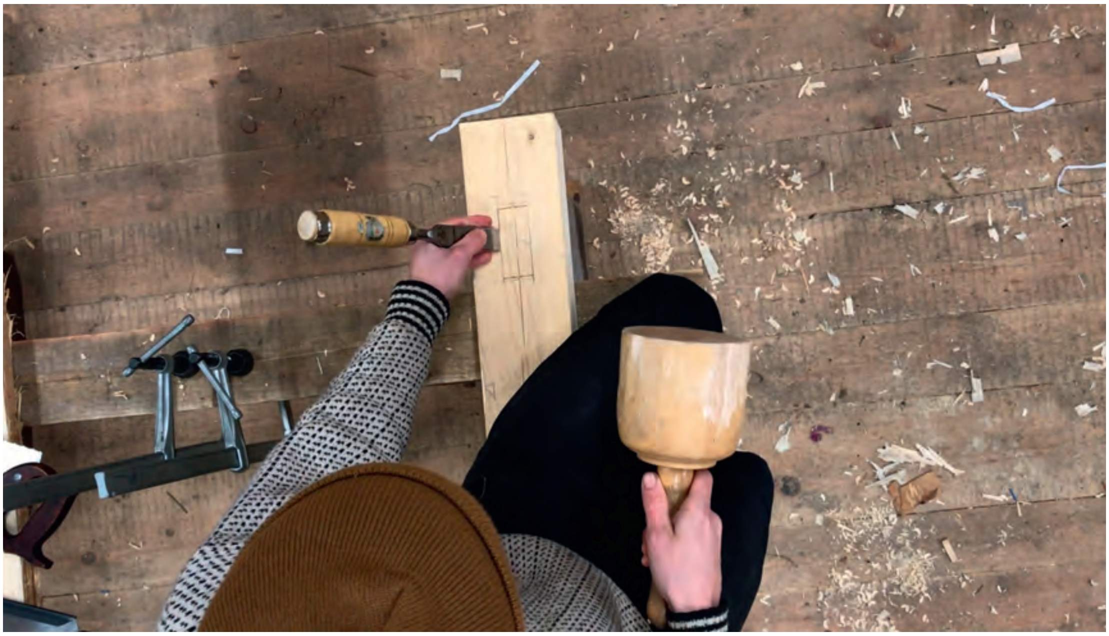


Figure 11: Part of the final video-based learning resource, with one camera directly above me and the other camera in front of me. The rest of the video will be published together with the finished learning resource of the whole course *Stolpverk 1*. Click the image to see the video if reading a pdf version, scan the code to the right or go to: https://youtu.be/DbgFTBF__iE. Video by Ulrik Hjort Lassen.

process, especially when things are done differently from their own practice.

I set up two video cameras at the same time and filmed myself in action. One camera was placed in front of me capturing the whole situation, how I move, and how I hold the tools. The other camera was placed directly above me which enables the viewer to see what I see when I work, which is something that the students often cannot see during practical demonstrations, where maybe one person sees well and 15 others do not. I chose to speak on the video, rather than adding my voice to the video at a later stage which I had done in the earlier study (YouTube, Hantverkslaboratoriet 2014).

Editing the video is challenging. You do not want the video to be boring, but you also do not want to leave out important information. I chose to make short video sequences of the different steps so that it would be easier to find specific methods or parts. With the help of a professional film editor, it was possible to cut some of the more repetitive parts and some of the irrelevant parts so that the video was not too long for watching. An example of this can be noticed in the video, where both clamps are removed one by one without seeing me do that. The final result works rather well in the sense that it shows more or less what I intended (see Figure 11).

Naturally, it would have been a better product if a professional team had filmed me and edited the video. However, it is of great importance that the person filming knows what is important and how to catch this on film, and also that the person editing the film knows about the procedure. A good solution might be that there is a close cooperation between the camera operator, the editor, and the craftsperson. The present video must be considered as the first version. In the future, film makers would be able to watch this video and use it to see roughly what I intended the final result to be like.

Another challenge with video-based procedural descriptions is that moving images are very dominant. It is possible that the learner will consider the demonstrated procedure as 'the true method' or as 'the only right way' when this is not the case. But this way of thinking is often found in the trade of today (Lassen 2014, 29). Combining the video-based procedural description with a paper-based one can be one way to show or discuss alternative methods and approaches. The focus in this specific study has been to investigate how to make a video-based learning resource within the trade of timber framing. An important result is therefore the video. But another result has been to show the complexity involved when describing a simple working procedure.

PAPER-BASED PROCEDURAL DESCRIPTION

In the earlier study, the paper-based procedural description was created using simple instructions and static drawings. As such, this could work as an instruction by itself, even without the video (Lassen 2014, 201). It also included supplementary notes in an information panel alongside the more simplified instructions to allow a deeper understanding without disrupting the attention of the learner. It was practical for the student to take the instructions into the workshop and to communicate the basic practical instructions as bridges into the knowledge (Lassen and Wood 2013, 45). This was more several years ago, and today there are even more possibilities to bring moving images and animations into the workshop using tablet computers or smart phones, and to include the videos in the digital version of the learning resource.

Images are very important when communicating craft skills as they reveal information about something's shape, size, proportion, and volume, as well as orientation, which can be difficult to describe in words (Linscott 2017, 28). But when the aim is also discussion and reflection, text-based descriptions can add another dimension, as "writing […] allows the communication to be ambiguous and uncertain" (Linscott 2017, 28). This is again a concern, depending on the level of skill the learners have. The learning resource in this study is mainly meant for novice learners, and compared to the earlier study, the paper-based part of this learning resource should be simpler and contain less hands-on information (Lassen 2014, 175). It is to be a complement to the video or the practical demonstrations, and it should explain in short terms what happens in action in the video.

However, layout is still important, and it is preferable that text and images appear together so each adds meaning to the other. This corresponds to the cognitive design principles for learning resources, which require "adding pictures to words, eliminating extraneous words and pictures, placing words near corresponding pictures, and using conversational style for words" (Mayer 2003, 137). Furthermore, the illustrations should only show what is necessary, avoiding unnecessary details, and it is often better to use two-dimensional images when explaining working methods for learners (Wood 2006, 53).

CONCLUSION

This study shows some of the considerations involved when developing learning resources in a practical field, and it is a case study which was used for developing the entire learning resources for the course *Stolpverk 1* and for developing the manuscript and videos for the book *Bygga i stolpverk* (Lassen 2021). It highlights some of the complexity involved when a carpenter is to solve a simple problem within the trade of timber framing. To make a mortice and tenon joint is not complicated, and when timbers framer have done this a number of times, they can stop thinking about how they do it, and so it can be difficult to explain to others what they actually do, and how they do it.

In this study my own carpentry experience of making the joint has been used as the main body for the learning resource and video has been used as a tool to delve deeper into my own practice. As I have experience from both practicing the craft and from teaching, I have been able to notice and describe most of the little movements in the video. Needless to say, I have not been able to notice or describe everything, but with my experience from teaching I have been able to decide which movements are of importance for the novice learner and which are not. In this way I have been able to make a procedural analysis of my own approach, which would have been difficult for a researcher without practical knowledge of how to cut a mortice.

It is important to notice that there are different ways of cutting the joint. The focus has not been to find the best way of cutting the mortice and tenon joint, but to develop a learning resource appropriate for novice learners. A similar learning resource could be made of other approaches as well, and there is the potential to demonstrate some of the different situations in future studies on video-based learning resources when the learners are more experienced (see Westerlund in this anthology). Hopefully, this learning resource will help future learners within the trade to get a basic understanding for the use of hand tools when working with timber frames. In contact with other actors within the field of timber framing, such as architects, engineers and building conservators, it might be of importance to describe the complexity of (what appear to be) the more simple carpentry tasks in order to demonstrate the complexity involved in practical problem solving, in choosing the right tools, and in using the tools correctly.

To do the same task many times is important in order to develop craft skills and practical knowledge related to working with timber framing. Repetition has therefore been an important issue within the trade of historical carpentry, and even today it must be considered when working with learning resources in a practical field. The practical knowledge of the carpenter will enable him or her to make a diagnosis of the situation and to choose an appropriate approach to solve the situation. To a large extent, the practical knowledge is developed by repetitive actions which help to incorporate the procedures into the body and also to develop the sensory experience of the carpenter. In the research group at the Department of Conservation in Mariestad, an important focus has been placed on how to analyse and describe working procedures, both when studying masters of the crafts and when developing learning resources for novices. Depending on the activity, there are different methods for this, from only text-based step-by-step descriptions to video-based descriptions but also the use of more theoretical tools such as traceology or time geography (Jarefjäll 2016).

Video has proven to be a good tool for recording the actions involved in the procedure and for the procedural analysis. It enables the practitioner (me) to focus on the working situation while actually performing it, to watch the video afterwards, and to analyse the procedure. The procedural analysis involved watching the recorded videos and writing down the procedure in text, and also separating the whole procedure into different steps. This has shown that there are many small steps and decisions that have to be made when cutting.

To make an instructional video is challenging. The advantage with video when recording working procedures for analysis is that a large amount of information is included in the video, but this also proved to be a challenge when recording for the instructional video, as too much information risks confusing the novice learner. However, a professional video editor will be able to cut out some of the irrelevant information. The video produced in this study must be considered as the first version, which could be improved by a more professional team. But even if the video-based learning resource is not perfect, it still demonstrates the working procedure, and combined with text and images in the paper-based learning resource it should be considered as an appropriate tool for transmitting craft skills when it is not possible to make workshops with hands-on demonstrations by experienced timber framers. Or, rather, it can be used as a complement to these demonstrations, enabling the learners to see what I see when working and to watch the same video sequences many times.

It would have added more credibility to the study if the result had been tested on groups of students to see how they respond to the learning resource, as was done in previous studies (Lassen and Wood 2013, 41–44). Hopefully, these learning resources will be tested many times by students and other learners, and therefore the evaluation of the learning resources will be a project for further studies.

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ENDNOTES

1. Timber framing is a type of construction where the load-bearing skeleton consists of square, two-side converted or round timber of dimensions four by four inches or larger, and where the internal and external loads are transferred to the ground by a cooperation between vertical, horizontal, and/or diagonally positioned timbers (Lassen 2014, 14).
2. The person who has mainly developed the structure of the courses, my former teacher and colleague Nils-Eric Andersson, sadly passed away in June 2017. Today the courses are changing for mainly economic reasons, and therefore the course structure from 2016 seems to be the best point of departure for the learning resource.
3. In the 1980s, a revival of building timber frames started in the USA and in 1985 the Timber Framers Guild was founded. They have published several books and, since 1985, a journal with much information on methods, structures, and tools, both relating to historical times and to the present day.
4. When used efficiently, the boring machine can take around half the time for cutting a mortice compared to a chisel and mallet (CRAFTLAB), but it is quite unusual in Europe and expensive to buy from the USA.
5. In Germany the mortice axe was forbidden by law at the end of the nineteenth century, as too many people died from cutting themselves in the face when trying to look at their work.
6. The video was recorded in the beginning of October 2018 and the timber was sawn in spring of the same year.
7. In the exercise (see Figure 10) the tenon is defined to 40x80x80 mm, but I have found that it is better for the students to have a mortice which is a little longer, as it is easier to clean out the chips in the bottom.
8. When I started my carpentry career in the Danish vocational school, we used a cross cut saw when cutting timber lengthways. There, I experienced that cutting in this way with a handsaw is not an attractive approach. The first time I tried a rip saw, at the Department of Conservation in Mariestad, I realised that this approach works rather well. Most Danish carpenters believe that a hand saw is not an attractive choice of tool for cutting lengthways.

SCIENCE IN CRAFTS

The second theme, Science in Crafts, describes the use of existing scientific research methods that are modified for the purpose of craft research. While research through craft practices are new in the academic field, new methodologies that take the nature of the practice into account need to be developed. Often, sensory evaluations of materials or situations are highlighted in this context, which makes the researcher's own longitudinal craft experience a necessary part of the analysis. Arja Källbom's chapter "Using Profiling Methods to Develop the Sensory Vocabulary of Architectural Painters Who Use Linseed Oils" shows that subjective evaluations are necessary in craft research, but that their credibility may be asserted by group evaluations or the use of systematic approaches, such as the Repertory Grid Method. Similarly, Lars Eriksson writes in his chapter "The Waiter's Craft Knowledge of Meal-design" about how visualisations through Time and Space Geography help him to research his practice using rigorous methods from the field of Human Geography. The third chapter in this theme "Exploring Folk Art in Historical Interiors" by Ingalill Nyström, Anneli Palmsköld, and Johan Knutsson, explores the Art Technological Source Research method. These methods are borrowed from other contexts and modified to suit the practices under study here. By supplementing research through human actions with a structured research setting, rigour is added to both data collection and analysis.

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KEYWORDS: Linseed oil, linseed varnish, maintenance, heritage painting, painting craft, painting skills, practice, profiling, perception, repertory grid method, principal component analysis, material vocabulary, sensory quality assessments, quality control.

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Using Profiling Methods to Develop the Sensory Vocabulary of Architectural Painters Who Use Linseed Oils

By Arja Källbom

INTRODUCTION

This text exemplifies why and how the craft competence of architectural painters and paint-makers is important. It also describes how sensory profiling methods could be used in craft research in order to stimulate increased craft competence, communication, and education.

During the last half of the twentieth century, most of the traditional architectural paint binders (a crucial ingredient of the paint), such as linseed oils and vegetable and animal glues, were substituted by modern materials such as alkyds, latex, and other petrochemical products (Johansson 2001; 2004; Karlsdotter Lyckman 2005; Fridell Anter, Svedmyr, and Wannfors 2010; Standeven 2011). Over several decades, the common craft competence in relation to painting materials and procedures depleted as a direct result. Many of the older, traditional paint binders have been actualised again, since they are renewable, non-poisonous, and resource saving. Correctly used, the linseed oil paints provide beneficial results in terms of aesthetics, adhesion, and maintainability. Linseed oils and paints are needed for the preservation and maintenance of architectural and industrial heritage for painting and/or protecting buildings, structures, and artefacts with high demands on authenticity according to the Nara document of 1994. Examples of such objects are shown in Figures 1 and 2.

In order to redevelop and regain lost knowledge of how to make linseed oil paints which are similar in properties to those paints made before approximately 1930, the characters of refined linseed oils for paint-making, in terms of their chemical and physical properties, are important issues. The quality of the oils and regained linseed oil paints also need to be viewed from the perspective of craft practitioners.

Figure 1: Sikfors railway bridge in Sweden, built in 1912, presents an example of steel structures that need anticorrosive paint treatments. Photograph by Sven-Olof Ahlberg.

Binder and paint properties—such as the film-forming capacity, the drying time, and the body—are important features of paint. High film-forming capacity includes properties such as film elasticity, film hardness, weathering resistance, and the gloss of the oil or paint film. It is also relevant to discuss the liquid linseed oil's colour, clarity/turbidity, smell, viscosity and body, and its emulsifying or wetting capacity since these properties influence their usefulness for different applications. These types of properties were evaluated by the traditional painters and paint-makers before the shift to modern materials after the Second World War (Karlsdotter Lyckman 2005). Today, the characteristics of the materials and the sensory experiences related to them are seldom expressed in discussions with other craft practitioners. Sensory vocabularies could provide a quick referencing tool for painting professionals to check and control the quality of linseed oils, in order to assist in choosing the right oil for a particular purpose. A sensory vocabulary describing linseed oils can be initiated by descriptive methods, and further tested and developed in practice by painting professionals. It presents

Figure 2: A nineteenth-century railway bridge at Björneborg, Sweden. How can we take care of this heritage when the nature of the authentic painting materials has changed and few paintaers have the appropriate skills to use linseed oil paints? This issue requires communication about the interaction of tangible and intangible elements of materials and working procedures. Photograph by Sven-Olof Ahlberg.

a way to increase their so-called *competence space* and provides an opportunity to obtain and develop their craft knowledge (Sjömar 2017, 85). This will also allow for an exploration of the intangible heritage associated with the use and making of linseed oil paint, and an involvement of the paint craft practitioner's knowledge in the process of developing and documenting evidence-based treatment procedures. Ultimately, this will lead to the improved management of architectural heritage objects.

The food and beverage industry, and related research fields such as sensory profiling, utilise a large variety of methods and panellists (Murray, Delahunty, and Baxter 2001). Methods include consumers' or professionals' profiling of products for communication and product development by creating vocabularies[1] (Swahn et al. 2010; Larssen, Monteleone, and Hersleth 2018). In the food industry it is common to use expert panels who are trained in articulating their perception in consensus (Liu et al. 2018, 899). The training of the professional panels is very costly, and the experts become skilled in discriminating the finer details (they also need about three times longer training than novices). By using so-called free-choice profiling where the panellist can express their perception freely, consumers (novices) create their own vocabularies for describing products, without prior consensus or need to describe exact meaning (Guàrdia et al. 2010, 148). Investigations have shown good results when new panels create initial vocabularies themselves and refine them with increasing experience of using them (Murray, Delahunty, and Baxter 2001). In this chapter, several methods from the field of sensory studies were used for defining the basic sensory vocabulary regarding olfaction, and haptic and visual properties of refined linseed oils for architectural paint-making purposes. The research methods and research design in this study are new for craft research, and the interdisciplinarity strengthens the credibility and rigour-relevance of this work.

Observing and constantly interacting with the material (the linseed oils or paints and the substrates) could be considered as an art of or process of correspondence (Ingold 2013, 30–31; 2018, 162; Kuijpers 2018, 881–86). To have skills is to recognise and respond (and to be responded to) by the affordances that the materials offer. This is a vital aspect of making with different possible results. This led to a close understanding of the materials associated with the craft practice. Ingold refers to skills as the initiation of all knowledge, and the words connected to skills as "among our most treasured possessions" (Ingold 2018, 161). Kuijpers suggests that the interaction of skills, materials, and making is an integral part of cognitive practice (Kuijpers 2019, 609). The use of "Perception Categories" is a research design that sorts material qualities, behaviour, and performance in order to systematically explore properties that are relevant to craft practitioners or craft research (Kuijpers 2018, 867; 2019, 612.) Material knowledge described from a craft point of view is similar to the knowledge that material science describes, but differently. These aspects are also relevant to this study, where this insider's perspective is highlighted.

The aim of this chapter is to describe the process, results, and experiences of developing a basic sensory vocabulary for linseed oils. The research questions are: *How do painter professionals express their sensory experiences of different refined linseed oils? Is it possible to distinguish between different oil categories or properties by their sensorial attributes?*

CRAFT RESEARCH

This craft research is conducted at Gothenburg University in the Department of Conservation. Craft research is characterised by exploring research questions *in*, *about*, and *through* tangible and intangible aspects of crafts by the craft practitioners themselves. The craft practitioner who is studying a craft can be both subject and object and has the craft skill and competence, which are conditions for performing and explaining the procedures of the craft (Sjömar 2017, 85, 93, 102). In this study, craft practitioners are information sources that generate data through their perception and experience of their painting material. The research setting, the data collection/generation, and the interpretation are made by the author, who is also a painting craft practitioner.

The research questions in this study and in my PhD thesis are grounded in my experience as a traditional architectural painter and building conservator, self-employed for approximately 15 years, working with the preservation and restoration of heritage paintings. I usually work with listed buildings, or other public or private house stakeholders. My task involves making and using paints of different types. Attending a sensorial profiling in Örebro University at the School of Hospitality Culinary Arts and Meal Science made me interested in how sensorial experiences of different food stuff and beverages could be recorded and evaluated. This occasion was really the starting point for me becoming increasingly conscious about the odours that we are surrounded by. A dialogue started with Örebro University about whether the sensory profiling methods were also suitable for painting materials such as linseed oils.

HUMAN PERCEPTION SYSTEMS

How the human perceptions system actually works, with the entire human organism, body and mind interacting with the environment, is in strong contrast to the Western world myth of dualism between body and mind (Ingold 2011, 258). In a revolutionary book by James Gibson, *The Senses Considered as Perceptual Systems* (1966), the author reshapes the view of how our perceptions work (overviewed by, for instance, Carello and Turvey 2017; Charles 2017; Covarrubias et al. 2017a; 2017b). Gibson points out that *having sensations* is not the same thing as to *sense or to obtain perception*. Perceptual experience is something we *do* and it is a process through which an individual can become aware of the world, and to get information via active and qualitative interpretation about lived experiences (Gibson 1966, 1; Noë 2004, 1). Collecting information occurs by analysing the constant energy fluxes in the surroundings in the forms of vibrations, reflected or emitted light, and chemical emissions from objects, events, surfaces, pictures, terrain, and other animals (Gibson 1966, 7 ff.). Our senses are active and conscious (not passive or unconscious), interrelated (not mutually exclusive) systems (not channels), and work as perception systems (ibid., 47). How humans perceive information depends on our acts of looking, listening, smelling, tasting, touching, and feeling (etc.) (ibid., 268). This depends on how we have learned to perceive our presence and expectations, receptors, language, and illusions (ibid., 266). Humans continue to learn throughout their lifetimes through attention and associative learning and the use of mental imagery (Gibson 1966, 266; Barsalou 1999, 585). Humans continue to develop the nerve system and cognitive capacity throughout their entire lives (Gibson 1966, 266 ff.; Barsalou 1999, 585; Palmiero, Di Matteo, and Belardinelli 2014, 144).

Haptic Perception

The term *haptic* derives from Greek and refers to "the ability to hold on" (Gibson 1966, 97 ff.). In ordinary speech, haptic is often called *tactile touch* (without body movements). Using haptic perception, it is possible to receive active information about the environment through literal and physical contact with the body, with skin, joints and bones, by grasping and moving with the hand; dynamic touch/actions of rubbing, scraping, rolling, brushing, or motions of depression/torsion or traction of skin, in combination with other organs, such as the mouth or eyes (ibid., 134). Characteristics of surfaces, materials, and tools can be investigated with hands acting in both performatory and exploratory ways. Features such as the geometry of the object (shape, dimensions, proportions, slopes, edges, size, etc.), surface properties (texture, surface profile), or material consistency (relative temperature, shape, weight, softness, rigidity, elasticity, viscosity) could be assessed (ibid., 274). The haptic perception strongly interacts with vision, and the sensory attributes are often visionary (Dagman, Karlsson, and Wikström 2010, 15–16). When people are forced to verbalise their haptic perception, they are usually able to do so, but with initial difficulty. Active haptic perception is an everyday activity, but the experiences are rarely discussed with others, and therefore the language is underdeveloped, just as is the case for odours.

Odour Perception

The fact that humans are strongly visual creatures has led to the stimulation of language for describing colour perception in contrast to, for instance, odour perception (Zucco, Herz, and Schaal 2012, 8). For a long time, a myth has been nurtured that the human sense of smell is very underdeveloped (McGann 2017). The work of McGann (2017) and Keller and Vosshall (2016) shattered this myth by conducting extensive tests and calculating the combinations of perceptions. It has been shown that humans are capable of distinguishing about one trillion different odours, and even follow scent trails through dog-like behaviour (McGann 2017, 3). Humans recognise odours that we have sensed for only three seconds (Zucco, Herz, and Schaal 2012, 96). We are surrounded by smells—that is, gaseous compounds in relatively low concentrations that we are usually not aware of (Zucco, Herz, and Schaal 2012, 7; Young

2016, 529). In real life we track, locate, recognise, and secure odour sources, maintaining our needs in an ever-changing environment (Zucco, Herz, and Schaal 2012, 118). Ferdenzi et al. (2013) have investigated the influence on gender and culture on olfactory responses and reported differences in perceptions for men and women.

Visual Perception

Vision is our superior stimulus (Gibson 1966, 154 ff.; Young 2016, 520). The visual perceptual system is connected to our balance organs and dominates over performatory skills (Gibson 1966, 36). Sensor motorial skills are important features for seeing; seeing requires action in movement (Noë 2008, 663). This means that we must have an understanding about how stimuli change by the way we move and look, because what we see does not make sense unless we actively interpret what we see by referring to our earlier experiences (Noë 2004). For instance, we have learned how things look or how they are, and how to accept perspectives, illusions, or after-pictures (Gibson 1966, 289; Noë 2008, 665). In the craft of painting, vision interacts with all other perception systems for perceiving critical features, distinctive variations, and textures of substrate and paint materials.

RESEARCH DESIGN, METHODS, AND PROFILED MATERIALS

The research methods are focused on making the professional painters' perception explicit, systematically organised, and analysed. Overall, this means processing and interpreting of qualitative data (words) aided by semantic and conceptual codes versus frequency. The data-collecting sessions were executed on different occasions in the participants' workshops. Figure 3 shows the three main sections of the research study.

Part 1: Olfactory Profiling

The research design uses an interviewing technique of free descriptive profiling by the Repertory Grid Method (RGM), semantic raw data sorting and coding, with statistical correlation method, i.e., Principal Component Analysis (PCA). The formulation of the database has been designed before the first profiling session. The raw data is reported online to the database by each panellist during the profiling session, and extracted by the craft and sensory researchers during the data processing and analysis step. Mean values, standard deviations, and variances of attributes and intensities for each linseed oil are calculated after the semantic sorting and processed during the PCA. The olfactory profiling has earlier been reported in detail by Källbom, Nielsen and Örström, 2018.

Part 2: Haptic and Visual Profiling

The research design uses an interviewing technique by free descriptive profiling (without intensity scaling), reported online to the database by each panellist during the profiling session, and extracted during the data processing and analysis step. The attributes are semantically sorted and coded, and their frequency is plotted in Excel for each linseed oil.

Part 3: Post-Evaluation

The research design uses post-evaluation of the sensory profiling in Parts 1 and 2 by interviewing the panellists about their experiences some weeks after the sensory profiling sessions. The panellists respond to an open-ended questionnaire through Eyequestion. They respond freely and according to a 1–10 difficulty scale (10 is experienced as "most difficult"). The data is then extracted from the da-

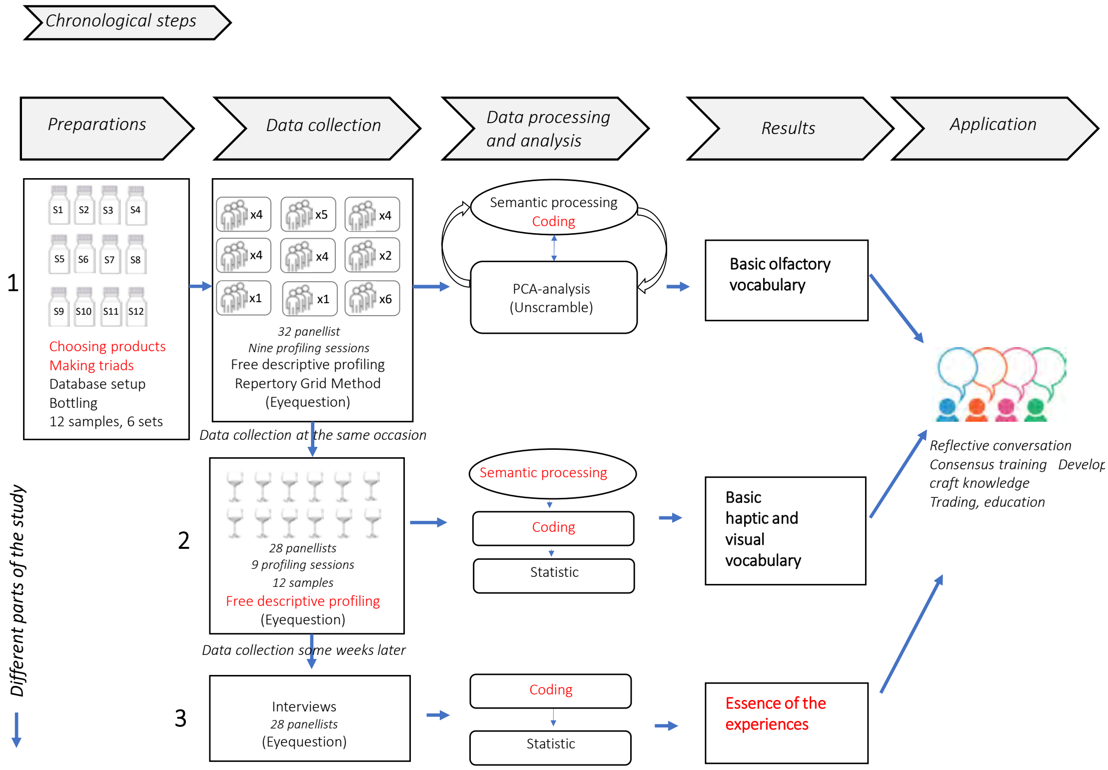

Figure 3: A model of the research study design. Red text in the figure indicates craft knowledge inputs by me, as the craft researcher. I also participated in all of the activities. Model by Arja Källbom.

tabase and quantitative analysis of the sorted and coded data is then performed. The results from this part are not reported here.

Panellists of Painting Professionals

The voluntary research participants that smell, look at, and touch the different linseed oils consist of 32 traditional Swedish architectural painters, paint-makers, and students. There are 16 of each gender, and their ages vary between 30–72 years. They are colleagues and peers, and all are part of the painters' craft community. About 90% are self-employed. All are non-smokers and free of colds or disease during the sessions. Of the 32 panellists, 28 (including me) are considered to have professional competence and know-how in their craft fields according to the competence model of Rolf (2017, 53). Given this fact, they have an ability to control the quality of their craft/work and results by will, and to manage complex problem solving. The others are architectural paint students with lower levels of proficiency. All panellists are described as positive, focused, engaged, and seriously interested in participating in the research. Some of the panellists during the olfactory profiling can be seen in Figure 4.

Figure 4: Painting professionals as panellists in the olfactory profiling. Photograph by Arja Källbom.

Profiled Linseed Oils

There were four categories of oil chosen for profiling: raw (unheated) oils, low-temperature heated oils (130–150 °C with/without air-blowing), high-temperature boiled oils (ca. 250 °C), and vacuum boiled oils/standoils (280–300°C), see Figure 5. Three refined linseed oils were chosen for profiling from each of the four categories. The samples depict a variety of products available on the market for Swedish professional architectural painters and paint-makers. Some of the linseed oils are manufactured in European countries and some in Sweden. All oils are purified by the suppliers utilising various methods. No exact refinement process temperatures or holding times are known. With the exception of the raw oils, all have added driers and none of the oils contain solvents. In order to ensure the quality of the oils, all oils used are a maximum of 12 months old. The study was finished within two months at the panellists' workplaces.

	Type of linseed oil/varnish		*Type of linseed oil/varnish*
A	Raw	G	High-temperature double-boiled
B	Raw	H	High-temperature boiled
C	Raw	I	High-temperature boiled
D	Heated (marketed as "Boiled")	J	Standoil, Viscosity 2,0 Pa•s
E	Heated (marketed as "Boiled")	K	Standoil Viscosity 2,0 Pa•s
F	Heated (marketed as "Boiled")	L	Standoil, Viscosity 4,5 Pa•s

Figure 5: Profiled linseed oils and varnishes.

Research Methods

The Repertory Grid Method (RGM) was developed as a systematic one-to-one interviewing technique for explaining and rating perception in psychology tests (Kelly 1955). The method facilitates the collection of individuals' response data with stimulus organised in triads. RGM is common in the food and beverage industry but is used in a wide variety of research fields. It can be used in, for instance, the development of vocabularies for different types of products, prototype development, sensory mapping, correspondence in consumer perception, and response to products (Murray, Delahunty, and Baxter 2001, 463). In this field, RGM is often used for studies with consumers—i.e., where the product end-users are panellists (for example, Swahn et al. 2010, 594).

The sensations from the linseed oils were profiled in comparison-sets of three samples (eight triads in total, see Figure 6.). In each triad, two oils are similar while one differs, making it easier to distinguish the differing profile. The panellists note their associations (i.e., attributes) through each triad, and then finally choose a maximum of their ten key sensory attributes. The attributes are reported to the database via an internet link provided by mobile phone or computer. After this, the participants are asked to sniff each oil again and to rank the expe-

Triad 1: A+ C + G	Triad 5: D + G + H
Triad 2: B + I + J	Triad 6: E + F + I
Triad 3: E + H + F	Triad 7: A+ F+ H
Triad 4: L + D + K	Triad 8: B+ K + L
Note: All oils except C and J were evaluated twice during data collection. The repetition of triads was done in order to intercept a broader series of sensory attributes and to increase the possibility of acquiring more associations and verbalisations.	

Figure 6: Triads used during the data collection in Part 1 (Källbom, Nielsen, and Öström 2018, 4).

rienced intensity of each attribute on a scale of 1–9 (with 9 marking the most intense) and to report this to the database. In order to avoid self-adaption, the olfactory sense is neutralised by self-sniffing hands or clothes. The participants are instructed not to use unspecific hedonic words such as good, bad, un/pleasant, etc. Specific items or objects are prioritised before unspecific personal words in order to increase the consistency of the descriptions (similar to Zucco, Herz, and Schaal 2012, 97). The panellists are free to take the time that they need or to take breaks in order to avoid fatigue.

The sessions were video recorded by me, the craft researcher, who also wrote a diary recording the events. Afterwards, these materials were studied and analysed by me as part of the participatory observation technique.

Each oil used for the olfactory profiling (Part 1 of the study, according to Figure 3) is stored in transparent borosilicate glass bottles of 100 ml for chemical laboratory purposes and labelled with randomised three-digit numbers. The bottles are filled up to approximately 95–98% and stored in a cool and dark place between the profiling sessions. Before each session they are acclimatised to room temperature. Each panellist has their own set of samples for sniffing (see Figure 5). In each triad the digitised bottles are served by the panellists, and the contents are sniffed repeatedly. Some panellists sniff inside the cap.

Oils for haptic and visual profilings (Part 2 of the study) are stored in transparent borosilicate glass bottles of 1000 ml and poured into red wine glasses before profiling. Bulbs with a temperature of 6500 K, 1320 Lumen, are used as complementary light sources. The participants use free descriptive profiling (without intensity ranking) to describe their experience of colour, turbidity, viscosity, and sensorial experience of each oil (see Figures 10–15). The panellist could perform the profilings in the way they wanted. The wine glasses provided the opportunity to swirl the oils and to touch the oils with glass rods. They were free to discuss with other panellists. The attributes were reported to the database Eyequestion by link. The used oils were discarded after profiling and the bottles were filled up between each profiling.

DATA ANALYSIS

The response data of Part 1 is extracted from the database and semantically sorted after conceptual meaning and the frequency of responses (≥ 5), in cooperation with a semantician, a food sensorial researcher, and me, the craft researcher. The sorting is performed into groups and further into subjects and adjectives. The sorting and coding processes are repeated approximately ten times to reduce the number of groups from 316 to 254, and then further into 29 (Swedish) odour attributes. Redundant attributes are eliminated and similar words are merged into the groups. Attributes that are too unspecific are excluded. Words that relate inclusion (i.e., hyponymy) are sorted in taxonomical lexical hierarchy (as described by Cruse 2001). All types of nuts are sorted into nuts, all types of flowers into flowers, etc. If the attribute is described as an object—a noun—that does not exist as a Swedish adjective, the noun is used in the vocabulary.

After the olfactory data sorting, the Principal Component Analysis (PCA) is carried out. PCA is a mathematical method that transforms a set of variables into a reduced number of uncorrelated variables called principal components by an orthogonal transformation (Westad et al. 2003; Hersleth et al. 2005). Systematic variations in data can be correlated between the objects (linseed oils) and the variables (sensory attributes and their variances), revealing cluster formations and patterns. The coordinates of the data are transformed into principal components (with samples on the y-axis and variables/sensory attributes on the x-axis) explaining the variance of the results in new bases of multivariate data distribution (score plots/map of samples) and the contribution and correlation of each variable (loading plots/map of variables) for observing the relative importance of each principal component and their correlation. A biplot is a combined score plot and correlation loading. The Unscrambler X, a multivariate analysis software (version 10.5) (CAMO Software, Norway), is used for PCA calculations and visualisations, conducted in cooperation with Örebro University.

After extracting the raw data in Part 2 from the database, a semantic sorting and coding of 1456 reported Swedish attributes (excluding symbols, etc.) is conducted by me, the craft researcher. Due to the more freely formulated answers, much effort was needed to code the attributes into basic semantic and conceptual groups, and to count the answering frequencies. Attributes with a frequency of ≥ 5 were included in the results. By analysing the meaning of the groupings, some main attributes are extracted and the basic vocabulary for each profiling is formed.

RESULTS

Part 1: Olfactory Profiling

The results show that different categories of linseed oils can be distinguished depending on olfactory qualities and that the sensory attributes can be correlated to the oil types. The score plot (Figure 16) shows sample categories corresponding to the different types of linseed oils. The largest difference can be seen between the standoils and the raw linseed oils (largest variance in PCA 1, i.e., the x-axis in Figure 16). There is a linear correlation between the clusters of raw linseed, the heated oils, and the high-temperature heated oils. Differences in variance can be distinguished between high-temperature heated oils compared to standoils and the high-temperature heated oils compared to raw oils.

The correlation loadings of the variables are shown in Figure 17. Sensory attributes such as *citrus fruit*, *fruity*, *sweet*, *buttery*, and *spicy* are, despite high frequency, located in the inner circle that explains 50% of the variance (and therefore the correlation to specific oils is low). This means that these attributes have been reported frequently but cannot be correlated to specific samples. They are still relevant for the basic olfactory vocabulary.

The biplot in Figure 18 shows that typical attributes for the raw oils are *mild*, *fresh*, *melon*, *grassy.* Heated oils are typically described as *sweet*, *flowery*, *buttery*, *honey*, *spicy*. The heated oils have the largest number of varying attributes and these varying attributes are sometimes similar to the attributes of the other profiled oils. The attributes of high-temperature heated oils are typically described as *nutty* or *like leather*. The standoils are associated with odours such as *solvent*, *decay*, *plastic*, *acidic*, *pungent/acrid*. Attributes such as *musty/hearty*, *earthy*, *rancid*, *bitter almond*, and *resin* may indicate

Figure 7

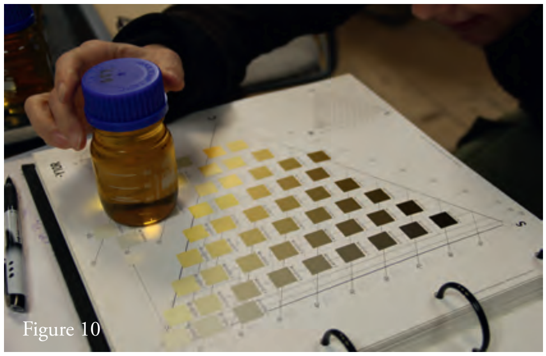

Figure 10

Figure 8

Figure 11

Figure 9

Figure 12

Figures 7–12: The linseed oils (for Part 2) in labelled wine glasses, Figure 7. The glass lids were kept on during the olfactory profiling so that the emissions from the oils would not confuse perception during the triads. During the olfactory profiling (Part 1), the oils are served in the laboratory bottles, Figure 8. After finishing all triads, the panellists chose a maximum of ten key attributes to report to the database via the internet, Figure 9. The panellists are then asked again to state the intensity (on a scale 1–9) of each attribute of each oil and report it to the database.

Examples of different ways to profile the colours of the linseed oils, Figures 10–11. The colours of the oils are actively perceived using the visual perception system by studying the reflected and transmitted visible light. In order to describe the colour, the oils (in bottles or glasses) are held against light sources, looked upon from different angles, put behind white/all reflective backgrounds, and compared in colour. The light sources and the examined oil volume affect the perception.

Turbidity is a measure of the clarity and visibility in an oil and is assessed by active looking, Figure 12. Suspended particles, or water, scatter the light and cause high turbidity—i.e., the visibility of the specific oil is low. The light sources and the examined oil volume affect the perception. The turbidity is checked by holding the oil vessel against a light source or white background and describing the light pathway through the oil in order to detect haze caused by trapped particles or gases. Photographs by Arja Källbom.

Figure 13

Figure 14

Figure 15

Figures 13–15: The viscosity of liquids describes the resistance to flow and is often referred to as the thickness of the fluid, Figure 13. High viscosity means that the liquid is thick and flowing with low velocity (or requiring higher force or temperature) when poured or running down a glass rod or swirled in a wine glass. The panellists comment on whether the oil is running or dripping off the glass rod. Some panellists used a graded scale 1–10 or 1–5, where the highest number represents the most viscous liquid. Additionally, the speed of an air bubble moving through a bottle when turning it upside down was commented on as fast, medium, or slow.

In the haptic profiling, the hand is both motor and sensor, acting in both exploratory and performatory ways, Figures 14–15. The active touch involves perceptions of complex interactions of viscosity, friction, wetting, temperature, adhesion, and tension of the oils on/between skin, muscles, and joints. The oils are rubbed, touched, smudged, pressed, lifted, etc. The amount of oil and the temperature and body of the oils affect perception. When in the hands, the mechano- and thermoreceptors cooperate with the visual system and search for characteristics. Photographs by Arja Källbom.

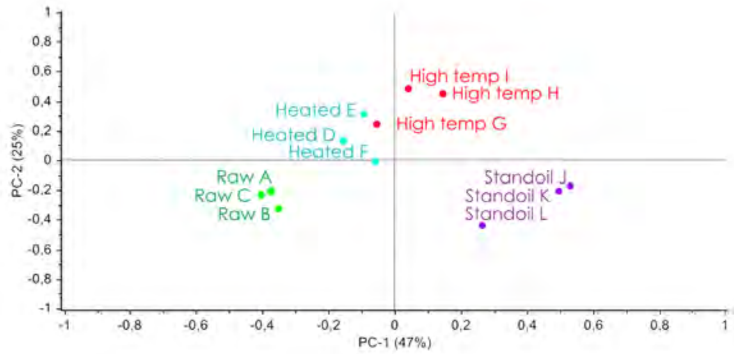

Figure 16: Score plot scores, first principal components versus the second, representing most of the variance in the data (explained variance PC1= 47%, PC2= 25%, i.e., 72%.) Data clustering can be connected to different data distributions for different types of linseed oils. (Modified from Källbom, Nielsen, Öström, 2018, 6)

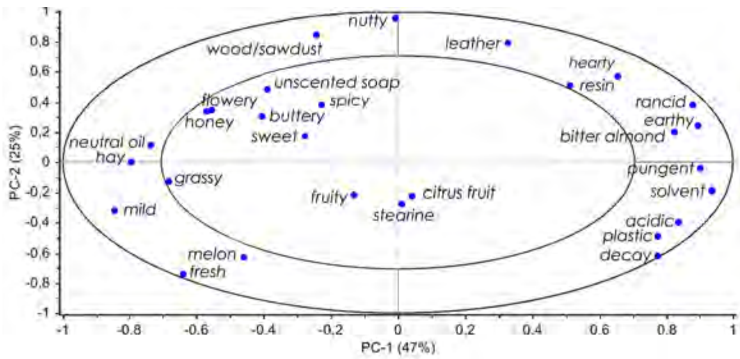

Figure 17: Correlation loadings plots from the PCA of odour quality attributes (PC1= 45%, PC2=25%) show explained variance for 50% and 100% of the results (Källbom et al. 2018, 6).

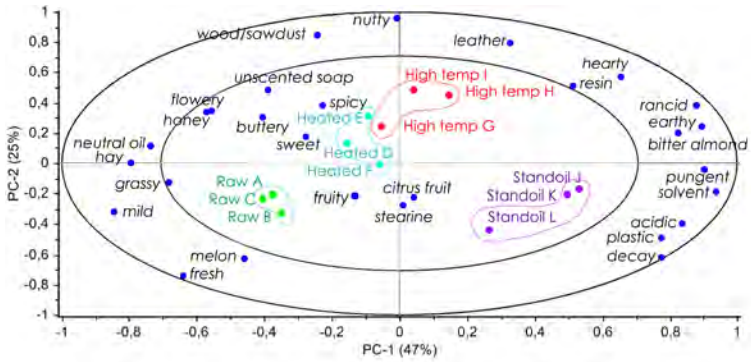

Figure 18: Biplot (score plot and correlation loadings) for PCA 1 (47%) and PCA 2 (25%). (Modified from Källbom, Nielsen, Öström, 2018, 6)

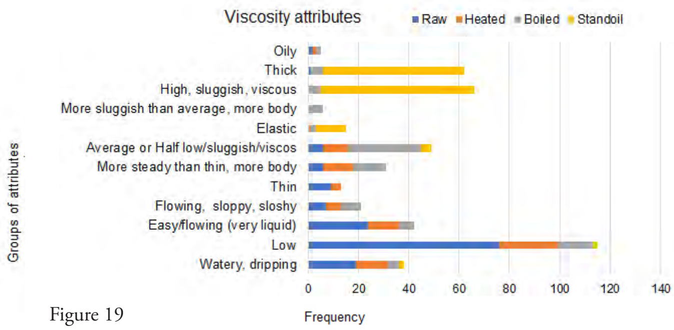

Figure 19

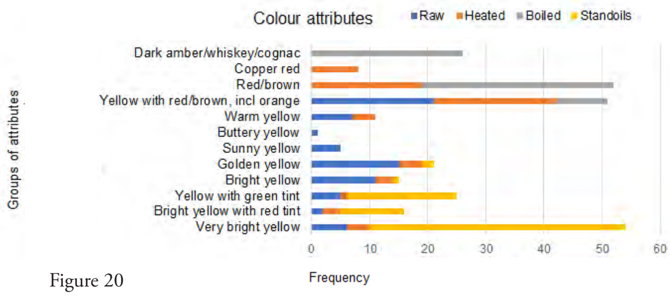

Figure 20

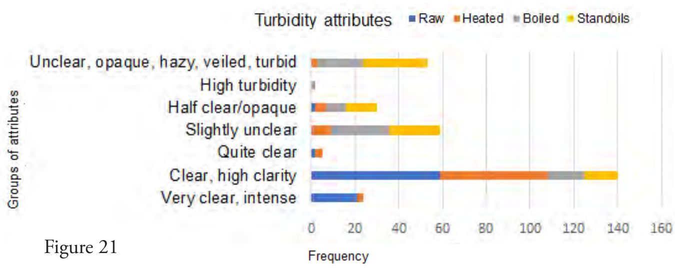

Figure 21

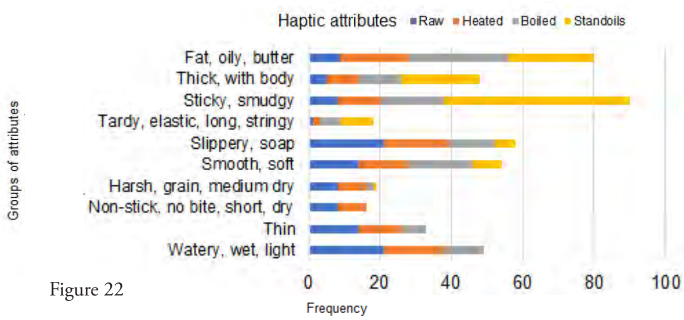

Figure 22

Figures 19–22. Frequency of visual and haptic attributes for different types of linseed oils. Note that some attributes describe approximately the same property for a type of linseed oil, like viscosity described as *watery*, *dripping*, or *low*, or *easy/flow* for raw linseed oils. This is considered when making the conclusions. Also note the differences on the scale on the x-axis.

characteristics of defect oils and are not connected to any particular group of oils. Tasting attributes such as *sweet*, *bitter*, and *acidic* indicate overlapping associative learning of tasting and smelling experiences. Differences in intensity may give differences in similar odour qualities, such as *acidic* (lower intensity) and *pungent* (higher intensity). Basic olfactory vocabulary can be seen in Figure 23. The Swedish attributes are also stated in order to reduce the risk of translation bias and to assist Nordic readers.

Part 2: Haptic and Visual Profiling

The number of categorised attributes appears to reflect the difficulties in naming the sensory perception. Easiest to profile seems to have been the properties connected to vision, such as colour (285) and turbidity (317); most difficult were the haptic properties (473) and those relating to viscosity (381). The profiling of every individual oil is summarised, and the attributes of a certain meaning are counted and categorised. The categories are formed into groups, as can be seen in Figures 19–22.

The oils' indigenous colours are described by the panellists by using colour-related adjectives, different everyday items or symbols/attributes, and the Natural Colour System (NCS). Oils with a high turbidity are more difficult to colour profile since the perceived colour is not uniform. A completely clear oil will appear as intense and deep. *Amber* is a very common symbol/attribute for colour, but since it is stated as yellow, orange, and reddish brown, as well as pale, milky, and light amber, it is difficult to use in any practical sense. Other attributes are mainly connected to transparent or semi-transparent beverages and liquids, and everyday items. It is common to associate the oils' colours to food stuffs. Very dark oils have no/limited visibility, but high turbidity is also commented on for very light yellow turbid standoils.

English odour attribute	**Swedish odour attribute**
nutty	nötig
buttery	smörig
acidic	syrlig
grassy	gräsig
decay, decomposition	förruttnelse/förmultning
earthy (cellar)	jordig (jordkällare)
mild	mild
rancid	härsken
fruity	fruktig
sweet	söt
fresh	frisk
flowery	blommig
pungent, acrid	stickande, skarp
plastic	plastig
musty, hearty	mustig, fyllig
spicy	kryddig
bitter almond	bittermandel
citrus fruit	citrusfrukt
hay	hö
resin, conifer	kåda, barrträd
timber, sawdust, wood	virke, sågspån, trä
neutral (cooking) oil, fat	neutral (mat) olja, färskt fett
stearin	stearin
melon	melon
honey	honung
solvent, chemical	lösningsmedel, kemisk
unscented soap	oparfymerad tvål
leather	läder
ocean, salt-water, shellfish	hav, saltvatten, skaldjur

Figure 23: Basic olfactory vocabulary for refined linseed oils and varnishes.

Water and *milk* are the only symbols used for describing turbidity. Haptic perception is the most difficult property to describe in Part 2. Despite the difficulties, a large number of attributes are used. There are some similarities between the reported attributes of viscosity and those of haptic experience. Symbols that are used include *water*, *oil*, *honey*, *syrup*, *treacle*, *motor oil*, *tar*, *cooking oils*. The sensory characteristics of the different types of linseed oils are seen in Figure 24. The basic haptic and visual sensory vocabulary is seen in Figure 25.

Linseed oil type	Odour	Colour	Turbidity	Viscosity	Haptic touch
Raw	Mild, fresh, melon, grassy	Bright, intense yellow	Absolutely clear	Low viscosity thin, short, dry, watery	Slippery, thin, watery, smooth
Heated	Sweet, flower, buttery, honey, spicy, leather	Orange Warm red	Clear	Low viscosity	Slippery, fat
Boiled	Nutty, leather, hearty	Dark red/brown	Slightly unclear/veiled	Average viscosity, sluggish	Sticky, smudgy, slippery, fat, oily
Standoil	Solvent, decay, plastic, acidic, pungent/acrid	Pale yellow with red or green tint	Slightly unclear Turbid	High viscosity, thick, bodied, elastic, fat	Sticky, smudgy, fat, oily, bodied

Figure 24: Characteristics of different types of linseed oils profiled in this study and Figure 6 in Källbom, Nielsen, Örström, 2018.

Main sensory attribute	***Synonyms, descriptions***
Colour	
Very bright yellow	*Very bright/pale yellow* (mycket svagt ljusgul)
(Light) yellow hue with green tint	*Yellow with weak green tint* (gul med svag grön ton, grönstick)
Bright yellow	*Sunny/golden/buttery yellow* (solgul, smörgul, guld/gyllengul), *strong, intense bright yellow, NCS Y10R* (stark, intensiv lysande klar gul ton)
Light yellow hue with red tint	*Warm yellow, dark gold* (varmgul, mörkguld), *yellow with weak red tint, NCS Y20 R* (gul med svagt röd ton)
Orange	*Reddish or brownish yellow* (gulröd/brun, orange), *orange, ~NCS Y50R*
Warm red	*Copper red* (kopparröd, brandgul, mörkt rödbrun), *intense dark orange reminding of unpatinated copper*
Dark red/brown	*Brown as whiskey or cognac, close to NCS Y70R (*mörkt rödbrun, whiskey/konjaksbrun)
Viscosity	
Low viscosity (låg viskositet)	*Watery* (vattnig), *low* (låg), *dripping* (droppig), *flowing* (rinning), *sloppy* (blaskig), *sloshy* (skvimpig)
Thin (tunn)	*Non-bodied or without body* (utan kropp)
Elastic (elastisk)	*Tough* (seg), *stringy* (trådig)
Bodied (med kropp)	*Thick* (tjock)
Oily (oljig)	*Fat* (fet)
High viscosity (hög viskositet)	*Sluggish* (trög), *viscous* (viskös), *high* (hög)
Turbidity	
Absolutely clear (helt klar)	*Very clear, clear, high clarity, low turbidity* (helt klar, låg turbiditet), *absolutely transparent, visible, high intensity, lustrous*
Clear	*Clear, high clarity* (klar, hög klarhet)
Clear with some turbidity (nästan klar)	*Clear, visible but slightly unclear/veiled/turbid* (klar men lätt grumlig/slöjig, beslöjad)
Veiled (något slöjig)	*Somewhat unclear/veiled/hazy* (halvklar, halvgrumlig), *some visibility* (något genomsiktlig)
Turbid (oklar)	*Non-transparent, opaque* (ogenomsiktlig), *turbidity* (hög grumlighet), *hazy* (simmig), *not visible* (*grumlig*)
Haptic touch	
Watery (vattnig)	*Wet* (våt), *light* (lätt)
Oily (oljig)	*Fat* (fet), *slippery* (glatt, smörjig), *soapy* (såpig), *buttery* (smörig)
Dry (torr)	*Meager* (mager)
Smooth (len)	*Soft* (mjuk), *full* (rund), *smooth* (slät)
Slippery (hal)	*Slippery* (glatt, glidig), *soapy* (såpig)
Harsh (sträv)	*Grainy* (grynig), *somewhat dry* (halvtorr)
Long (lång)	*Sticky* (klibbig), *stringy* (trådig)
Elastic (elastisk)	*Tardy* (seg), *stringy* (trådig), *gluey* (seg). *Similar to long.*
Short (kort)	*Non-sticking, without bite* (utan bett), *dry* (torr), *brittle* (spröd)
Sticky (klibbig)	*Sticky, tacky, smudgy, adhesive* (klibbig, kladdig,kletig), *gluey* (klistrig, limmig), *bite* (bett)
Biting (med bett)	*Sticky* (limmig, klistrig utan trådighet)
Thin (tunn)	*Thin* (tunn), *without body* (utan kropp)
Bodied (kropp)	*Thick* (tjock, fyllig)

Figure 25: The basic visual and haptic vocabulary based on profiled linseed oils.

DISCUSSION

To Identify and Name Sensory Perceptions

The human abilities to perceive sensations and to associate, reflect, and verbalise these experiences are basic conditions for the profiling methods. The ability to do so varies between individuals due to physiological differences, genetics, and history of life and experiences. Any act of perception includes the risk of failing to notice or the possibility of overlooking, experiencing misleading sensation illusions or sense adaptation. Acts of perception also offer great opportunities for collecting information. The research field of sensory studies deals with this by using a variety of interviewing techniques, statistical methods, and research designs to reduce the risk of bias or the panellists' fatigue.

In this study the sensory profilings indicate an increasing difficulty in identifying and naming sensory perceptions, from colour => turbidity => viscosity => touch => to odour. It is not so surprising that colour profiling was easiest to perform since vision is a strong system of perception. The panellists are painters, who assess and discuss colours on a daily basis. Turbidity profiling is similar to colour profiling. The difficulties of verbalising haptic perception are similar to the results of Dagman, Karlsson, and Wikström (2010). Odour profiling is experienced as difficult and exhausting. The panellists perceive chemical emissions by active sniffing. When the gaseous, lipophilic molecules reach the olfactory bulb in the nasal cavity, the receptors send signals to the brain (Zucco, Herz, and Schaal 2012, 101–2). The amygdala processes emotional experiences and the hippocampus processes associative learning in the brain, but the connection to language cognition areas is weak (ibid., 85). This is why it is difficult to name perceived and associated odours. The panellists are profiling the linseed oils in triads in order to make it easier to distinguish the sample that is deviating from the others.

Experiences from this study indicate that the ability to associate, recognise, and name odours can be trained in a short period. The two first triads are tough and frustrating, but after approximately 3–6 sniffs of each oil, it gets easier. After a day, the panellists are capable of ranking the oils by intensity and odour qualities, without neutralising the smelling sense between the oils. It seems that when the panellists become able to identify and name odours, they can then discriminate odours easily. This supports observations that verbalisation of odours will enhance a long-term mental imagery of the odours (Palmiero, Di Matteo, and Belardinelli 2014, 144). According to the panellists, the attentive, active interaction of haptic, visual, and olfactory perception of the refined linseed oils during the sessions gave them (embodied) memories to return back to when comparing these properties with those of other oils.

The results show that it is possible to correlate and distinguish between different categories of linseed oils (raw, heated, high-temperature heated, and standoils) and their odour qualities with PCA. It is also possible to correlate visual and haptic sensory attributes to the different types of linseed oils with the free-choice profiling method.

The results show in a pedagogic way the differences and similarities between the many variables and samples. In the haptic and visual profiling PCA was not used since the answers were given more freely and were not prechosen or ranked by intensity by the individual panellist for all of the oils, since this was a big and time-consuming task that would have led to fatigue. To avoid fatigue, a separate occasion would have been needed for the profiling session. On the other hand, the interpretation of the visual and haptic profiling was more difficult and time consuming, and also more dependent on my experiences as a painter. The correlation between the variables and the samples for visual and haptic attributes are not as clear as when PCA was used for the olfactory attributes of the linseed oils.

The use of symbols (representations) for describing sensory attributes is especially clear for odours, colours, and viscosity. These include everyday items and food-related objects. Odour attributes associated to defect materials and synthetic chemicals were also common. This confirms that familiarity to stimuli has a strong influence on semantic naming of sensory attributes, as described by Keller and Vosshall (2016, 12).

Craft Perspectives on This Research

How are the results affected by the fact that the panellists are craft professionals? The differences between trained expert panels and novices are related to the experts' higher cognitive ability and larger knowledge base (Schiefer and Fischer 2008, 347). Other studies such as those performed by Swahn et al. (2010, 612), Guàrdia et al. (2010), Bastian et al. (2008, 181), and Donadini et al. (2008, 341), confirm that the profiling made by consumers (i.e., untrained panels or novices) expresses approximately the same attributes but in a less detailed manner when compared to expert panels. The panellists of this study are to be considered as consumers of the products and end users. Still, they are novices compared to trained panels. It is probable that the panellists in this study, who are skilled in their craft but are not trained for sensory profiling, give less detailed responses than if trained panels had been used, but may still have beneficial sensory skills compared to non-painters.

However, the painting panellists contribute to the study with their use of professional praxis terms for describing sensory attributes. When there is a high level of involvement and need for a product, the efforts and quality of the profiling of consumers are affected according to Recchia, Monteleone, and Tuorila (2012, 153). The panellists' familiarities with colours, odours, touching, and looking at paint ingredients are considered as benefits for the results in this study. This has also enriched the existing vocabulary with new terms (for instance, for haptic touch) and it is valuable that the new terms and concepts come from the panellists since they are going to use them in their work. As mentioned earlier, benefits have been observed when new panels create initial vocabularies themselves and then refine them with increasing experience of using them (Murray, Delahunty, and Baxter 2001). Due to their working experiences, the panellists may have a larger smell reference library connected to linseed oils (or other drying oils) and paint ingredients in comparison to non-painter consumers. For instance, many (but not all) commercial paintmakers reacted to the odour of the linseed oils used in their own paint production. Experienced consumers have adapted over a long period of time to certain characteristic odours, and could respond differently than laymen (Recchia, Monteleone, and Tuorila 2012, 160). Painters may find the linseed oil odours less unpleasant and might be able to identify the quality and the attributes of the odour more easily.

To some extent, the participants were able to "blind" comment on, or suggest applications for, specific linseed oils, and their answers closely related to the types of applications the specific oils are actually commonly used for. Examples of a specific application would be to choose a watery raw oil without body (*mild*, *grassy* odour) for correcting absorbing substrates before painting; raw

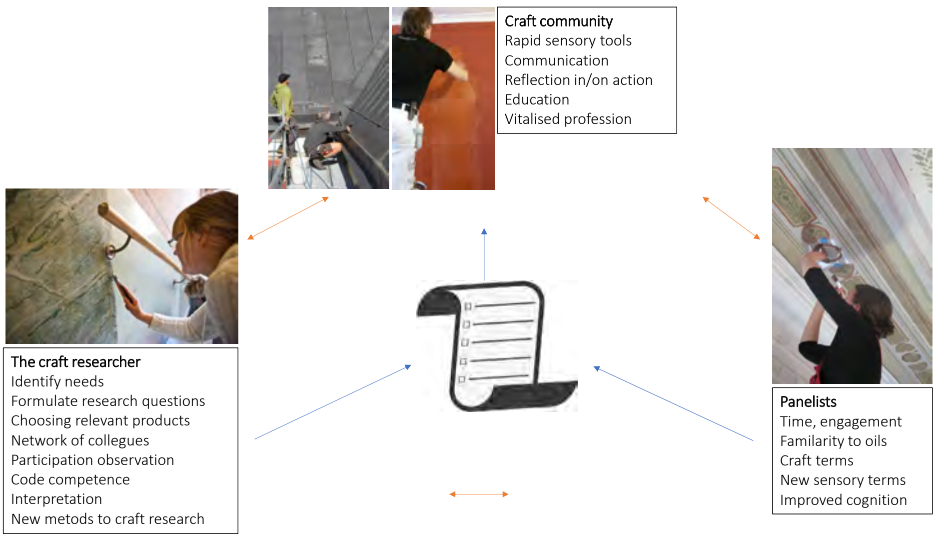

Figure 26: The craft researchers' and panellists' contributions to the basic sensory vocabulary affect individual painters and the craft community by interactions over a long period of time. Photographs by Arja Källbom.

oil or air-blown oils (*flowery*, *buttery* odour) with higher hydrophilicity are beneficial for making OW (Oil in Water) emulsion paints; fast-drying, high-temperature heated oils (with *buttery, nutty* odours) that form a glossy, elastic film are beneficial for making anticorrosive paints for outdoor use; refined fatty hydrophobic oils forming elastic and weather-resistant films (such as *pungent* standoils) could be added to top coats. The high-temperature refined linseed oils are also beneficial for indoor surfaces exposed to wear such as painted floors. The body of an oil affects the pigment wetting or the volume concentration and, therefore, the viscosity and applicability of the paint. Odour qualities such as *musty/hearty*, *earthy*, *rancid*, *bitter almond*, or *resin* may indicate features of decomposing oils, which may result in long drying times and low-quality paint films. Turbid oils could indicate rancidity due to moisture-initiated oxidation or low-quality film formation due to impurities. This could be important for making in-situ adjustments to paints depending on specific conditions.

The results depict the sensory characteristics of a number of different types of refined linseed oils available on the Swedish market and evaluated by a group of painting professionals. The need for communication of sensory attributes for different types of oils is identified by me as a craft practitioner and craft researcher. The same is valid for the formulation of the research question and the research design. The choosing of these particular linseed oils, and the grouping of these into triads, is affected by me since they are chosen due to their usage and types. As I participated in all of the profiling sessions, I also compare the proposed attributes with my perception experiences when formulating the vocabulary. An essential benefit of participation observation is to know things "from the inside," as Ingold points out (2013, 5). The semantic coding and interpretation of the attributes are also affected by my

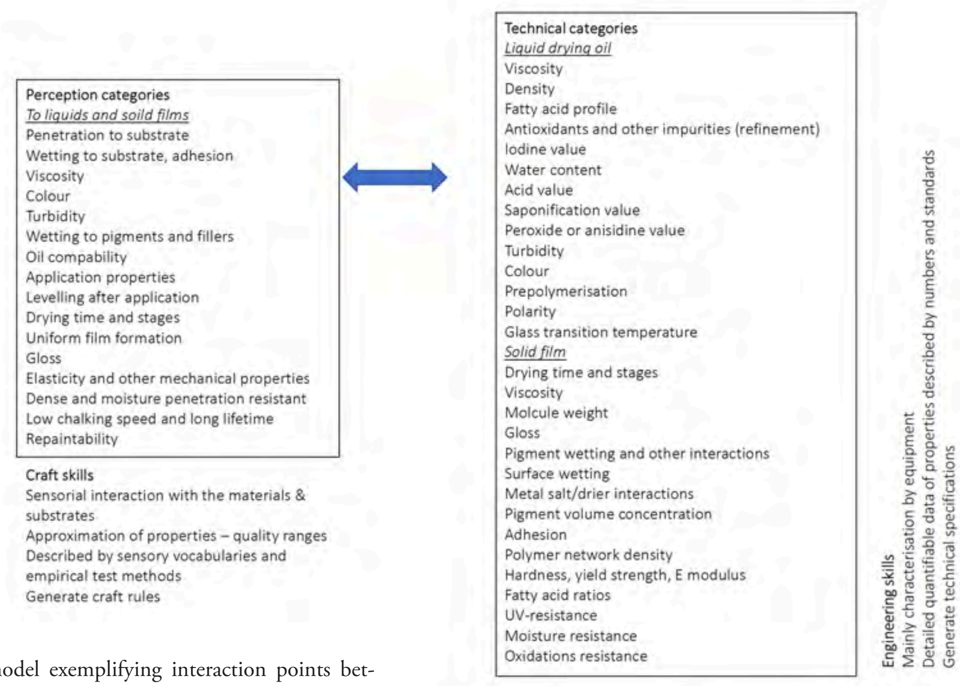

Figure 27: A model exemplifying interaction points between perception categories and technical (material science) categories for linseed oils and paints.

painting profession, since many are common craft terms. Examples of craft coding and interpretation of the attributes include describing the touch as *biting* (bett) and to know that it means that the oil has a quick and strong adhesion to the skin or substrate (almost elongating the skin), or describing the touch as *short* (kort) (almost a synonym for *dry* [torr]) to suggest that the adhesion is not so good and that elastic strings of oil are not formed between fingers when separating them. These types of distinction are probably very difficult to make for those who are not craft practitioners. This is called *code competence* and refers to hermeneutical knowledge and the ability to interpret tangible signs into the intangible (Almevik 2011, 167–68). I suggest that this is also useful for describing the meaning of craft terms and sensory expressions. Craft inputs and possible outputs of this study are visualised in Figure 26.

The sensory vocabulary will be tested further by the professionals in the process of reflective practices and conversations for improving craft knowledge and education, and the attributes are used in building a communication where the specific attributes are intertwined in the language. The profiled linseed oils are also characterised further, regarding chemical and physical properties. Relevant perception categories for linseed oils and paints could be exemplified in Figure 27, similar to Kuijpers's methodology (2018, 865–67). To this, technical categories are added and exemplified. These are attributes of the materials that could be characterised in a laboratory. Analogous to the methodology of Kuijpers, this is used to organise and analyse different types of data (Kuijpers 2018, 867). This could potentially be connected to a process chain where perception categories are added in order to visualise interactions (2018, 869, 879). As an addition, this methodology could be refined further by using reduced factorial research design experiments and the perception categories are then to be considered as variables. It

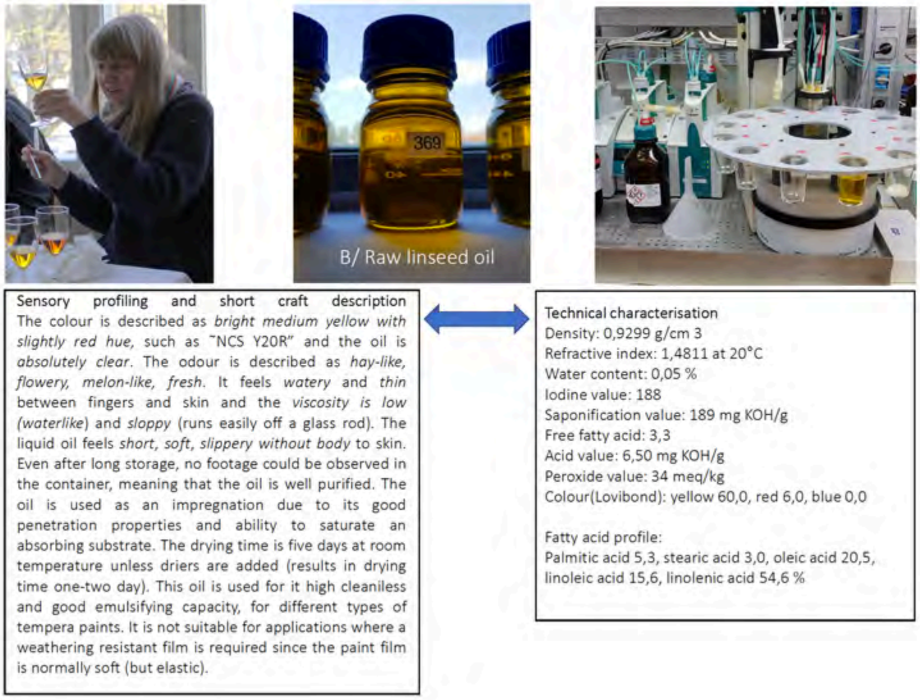

Figure 28. Example of how a raw linseed oil is described from both a craft and a technical (material science) point of view. Photographs by Arja Källbom.

could also be used as a basis for developing not only the chain of operations on one occasion but also a repetitive cycle of painting maintenance. Figure 28 shows an example of the sensory profiling of a raw linseed oil versus some of its technical, material science properties. The difficulty is to interconnect the attributes. There is not necessarily any dichotomy to the different types to characterise the same materials, but this is not the theme of this chapter. It is interesting, however, to note that engineering skills may also include craft or sensory skills, for instance to perform and interpret experiments.

The well-established research methods and research design in this study are not novel in the field of sensory studies, but they are new for craft research. The interdisciplinary transposing strengthens the credibility and rigour-relevance of craft research and worked well for the purpose of formulating an initial, basic sensory vocabulary for linseed oils. My experience as a craft researcher is essential for defining the problem, relevance, and aim of the study. It also influenced the interpretation of the results due to my code competence. Similar methods could be used further in this topic, for instance to sensory profile drying painted surfaces or the application viscosities of paint, etc. The research design and methods used here could also be used for other crafts needing to develop sensory vocabularies for the characterisation of materials. As well as traditional paint and surface treatments, mortar, plastering and rendering, gardening, gilding, and tarring may also find the methods useful.

CONCLUSIONS

Craft knowledge is partly lost from the area of traditional architectural paint-making and refined linseed oils. Descriptive sensory research methods common in the field of food and beverage sensory studies have been used in this study for the sensory profiling of linseed oils for architectural painting and paint-making purposes. The research methods used are interviewing techniques such as the RGM, combined with statistical correlation methods (PCA) and semantic processing and coding analysis for the development of a basic olfactory vocabulary. In addition, free-choice profiling has been used to form a basic visual and haptic vocabulary. The research design has worked well for this purpose and shows great potential for further applications in the field of craft research.

The results show that it is possible to correlate sensory attributes to different types of linseed oils. Sensory attributes of the linseed oils are expressed by combining existing painting terms and newly invented terms using everyday items such as foodstuff as symbols. Sensory attributes associated with defective materials and synthetic chemicals were also common. On the basis of the results, a basic sensory vocabulary is formulated by a panel of painting professionals for a number of refined linseed oils for paint and paint-making purposes from the Swedish market. The application of the current study is to encourage individual and collective interaction between craft and paint materials by providing a basic language which can be used in order to stimulate reflective practice, communication, and education in craft knowledge associated to architectural heritage.

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ENDNOTE

1. "Vocabulary" can be defined as a body of words, characteristic of, or adjusted for, specific functions (Svenska Akademiens Ordbok [SAOB] 2017).

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The Waiter's Craft Knowledge of Meal-design

By Lars Eriksson

INTRODUCTION

Crafts have traditionally been regarded as technical skills that require little or no theoretical schooling (Sjömar 2011; Almevik 2014). Craftsmanship in the restaurant industry is no exception. The restaurant industry is often viewed as an industry characterised by low requirements of prior knowledge and low wages (Fine [1996] 2009; 2009; Lainpelto & Lainpelto 2012; Lainpelto 2018). Meal-design performed by waiters is not only for pleasure; it can also have social and political goals, as discussed by Lugosi (2008), who points out that meetings will seldom be arranged without offering food or drink. To design a meal could be "to create a shared, experiential space in which participants become part of a contextually defined social entity" (Lugosi 2008, 141). Furnishing, table setting, and serving are part of a meal's design. The way meals are designed holistically affects how they are experienced by those in attendance and often gives the prerequisites for communication and being together in several different contexts such as government, industrial representatives, as well as for different nations. Procedures such as table setting and serving are performed every day not only in the restaurant industry, but also, for example, in hospitals. A waiter's inherent skill in practical performance and situational judgements—their craft knowledge—needs to be communicated because it is more meaningful than is perhaps anticipated.

Craft researcher and social anthropologist Trevor Marchand discusses the role of crafts and writes that "craft is about problem solving." But, Marchand argues, the solution to the problem is seldom discussed and noticed; it is often perceived as "a mundane task routinely executed in the flow of work and therefore unworthy of special attention" (2016, 2). This is in line with the chemist and philosopher Michael Polanyi's (1966) concept of tacit knowledge, used for describing procedural knowledge as automised through numerous similar situations—the practitioner is able to perform such tasks without much effort or seemingly without much attention. Another way to describe craft and craftmanship is to make knowledge of craft esoteric and unattainable, and associating it with feeling and intention (Sjömar 2011) or by stating that the knowledge "sits in the spinal" or is "a fingerspitzgefühl" as described by Rolf (2017, 55). On the other hand, social anthropologist Tim Ingold discusses the relation between thinking and making, and puts forward the idea that the theorist *makes through thinking*, and the craftsperson *thinks through making* (Ingold 2013, 6). Craft educator and design researcher Pirita Seitamaa-Hakkarainen (2000) discusses the holistic craft procedure which involves dual problem solving, within both the visual and compositional design spaces. Craft researcher Camilla Groth (2017) similarly emphasises the importance of knowing both the material properties and the manufacturing procedures in the process of designing something that works. This can be related to philosopher Bengt Molander's key concept *knowing in action* (2015) and Adamson's idea that "Craft exists only in motion. It is a way of doing things" (2007, 4).

In this chapter I aim to discuss and get closer to the often unspoken knowledge within the crafting procedures involved in the design of a meal situation. The aim of this study is to investigate research methods that could be used for verbalising the waiter's craft knowledge which is needed in designing a meal situation.

THE RESTAURANT AS A MEAL EXPERIENCE ROOM

A meal experience, as a holistic event, includes the following dimensions: "the room," "the meeting," "the product," "the atmosphere/ambiance," and "the management control system," according to the Five Aspect Meal Model (FAMM) (Gustafsson 2004; Gustafsson et al. 2006). FAMM is a theoretical framework for the planning and analysis of meals, developed within the interdisciplinary topic Culinary Arts and Meal Science at the University of Örebro. Creating and designing meals can be seen as part of the research area of hospitality. Brotherton and Lugosi are both researchers of hospitality with different perspectives, where Brotherton (1999) discusses hospitality as an exchange between humans to enhance mutual well-being through a provision of accommodation and/or food and/or drink. Lugosi (2008), on the other hand, distinguishes the production of "*hospitable*" as being the offer of food, drink, shelter, and entertainment, each representing different forms of hospitality. At first, "*hospitable*" is a provision to fulfil basic needs such as hunger, thirst, and tiredness, most often within a commercial transaction; secondly, it is a provision that has a social or political outcome "to establish a relationship"; and thirdly, it is a provision that is existential and facilitates a shared, experiential space in which the participants become part of a defined social entity (Lugosi 2008). Tourism researchers Monica Hanefors and Lena Mossberg (2004) are also interested in the social engagement and entertainment that often occur together with the consumption of food and drink. Something that can be seen as tacit knowledge is the restaurant's codes that, according to the sociologist Joanne Finkelstein (1989), shape the dining experience and are symbolised by a restaurant's ambience. In a similar way, the restaurant researcher Roy Wood (2000) argues that the guest's dining experience consists of both tangible and intangible aspects as well as of status-driven systems of "fashionability" and social exclusiveness. This is in line with the aspect of atmosphere/ambiance in the FAMM Model (Gustafsson et al. 2006).

In addition, the waiter's crafts of serving food and drink can also be about combinations of food and drink (Nygren 2004; Scander 2019), restaurant service (Walter 2011), the meeting between guests and the waiter (Hansen 2005; Jonsson, Ekström and Nygren 2008), and collaboration between colleagues in the dining room and kitchen (Wellton 2017). The accuracy of the table setting is emphasised by Gustafsson (2004), who writes that the table should be aesthetically appealing and attractive. To drink a good wine can be less pleasurable if the glasses are out-sized, or eating from a larger platter can be a source of irritation if the dining table is too small and the plate repeatedly clunks against crockery. These examples of absent attention to the function of a meal utensil can be seen as a lack of accuracy towards fulfilling a guest's physiological needs in a meal-experience. A waiter has the task of fulfilling the guest's needs and at his/her disposal are various utensils. The utensils necessary to carry out a meal can be seen as craft objects in the hand of a skilled waiter. The basic functions of these utensils—or, if we could call them, craft objects—are obvious, but so simple that they are often forgotten even though they have significant implications, as the craft and art researcher Risatti (2007) has argued. The waiter is responsible for furnishing, setting the table, and serving, and the consequences that these procedures give rise to, thus his practice is comparable to craft procedures. Research on how the guests' experience of food and beverages is affected by tableware has been conducted by Spence and Piqueras-Fiszman (2012). They argue that the weight of a glass container affects the way we perceive the taste of a drink. Similarly, Michel, Velasco and Spence's research (2015) showed that strawberry mousse was rated significantly sweeter when it was served on a white plate in contrast to when it was served on a black plate. Both Sobal and Wansink (2007) and Garcia-Segovia, Harrington and Seo (2015) state that the room, the furnishings, and the table setting all affect food intake and food acceptance. Overall, it can be said that research on the guest's meal experiences is about tangible factors within a restaurant context, such as the appreciation of food and drink, or the amount of food consumed. Although the FAMM model (Gustafsson et al. 2006) is interested in the elusive parts of a meal experience, both Finkelstein (2004) and Stierand and Wood (2012) have stated that the intangible circumstances of a meal experience—such as service, meal design, and atmosphere—have rarely been taken into account.

RATIONALISATION OF THE WAITER'S CRAFT

Furnishing, table setting, and serving are systematised work executed day after day, but the waiter's craft processes include more than carrying different utensils from one point to another. A process in this text means a series of steps taken together in order to achieve goals. A process is about *what* we do, for example to furnish, to set the table, or to serve. On the other hand, a procedure and the procedural knowledge describe and explain *how* we do something; procedures can be seen as explanatory factors which contribute to a skilful action (Rolf

2017, 50–52). To be ready for the guest's needs, which are sometimes completely unpredictable, the waiter has to prepare for a range of different risks for the upcoming serving procedures. Assistance for the waiter comes from recommendations given in textbooks (Hedman 1999; Bokstad and Eriksson 2006; Ingelsson 2016), where pictures and texts show and tell how the utensils are to be placed. For example, according to the advice from the Swedish expert headwaiter and restaurateur Uno Hedman (1999), the plate should be placed two centimetres from the edge of the table. One concept that is common in guidelines and connected to the waiter's craft procedures is *mise en place* (Jönsson 2012). A *mise en place* means to be predictable and anticipate the various risks that may happen during a meal. Hedman (1999) exemplified how to make a *mise en place* before the upcoming craft procedures. When a waiter plans for serving, his or her ability to pay attention in order to predict which problems and risks could arise is crucial. The philosopher Donald Schön argues that "professional practice is a process of problem solving" and stresses the significance of phenomena such as complexity, uncertainty, instability, uniqueness, and value-conflict ([1983] 2013, 39). A craftsperson within the restaurant area must predict, in their inner sense, how an upcoming serving procedure will be executed.

The profession of a waiter, like many other crafts, lacks identification because there is no certified title. The term *waiter* is used regardless of the waiter's level of knowledge, from a beginner to an expert. The practical knowledge of a waiter is not innate knowledge; it must be learned. Dreyfus and Dreyfus ([1988] 2014) point out that the acquisition of knowledge takes place in stages from beginner level to advanced beginner, competent, skilled, before finally reaching the highest level: expert. When the waiter has developed expert skills, new tasks can be added to their repertoire. Thereby the waiter, for example, could be a banquet manager and working directly with customers/clients who have ordered a big meal event in advance. These kinds of expert waiters lead the creative process and can be called meal visionaries, meal artists, or designers of a meal experience (Tellström 2003). He or she negotiates with the client how to execute the meal event. This can be described as a three-step process, with interpretation, commercialisation, and innovation (Tellström 2005). In the dialogue between the expert waiter and the client, knowledge of logistics and how the meal should be practically performed, as well as how it should be experienced, is required (Mossberg 2003). It is expected that the expert waiter can plan the event with, for example, exact serving times in order to create an operational schedule. Zampollo and Peacock (2016) examined methods and tools through Themes for Eating Design (TED) and introduced a design method, comparable to the FAMM model (Gustafsson et al. 2006), designed specifically to facilitate reflection on the eating experience and to aid a food design process. What is rarely investigated is how the waiter executes the craft procedures in order to meet the clients' and the guests' expectations.

There are several different professional roles in a restaurant context but a classic division is to distinguish between kitchen staff and dining-room staff (Jönsson 2012). In the kitchen, there are various work functions, such as head chef, sous chef, cold-buffet chef, pastry chef, and others. The dining-room staff consist of a cellar master, restaurant manager, headwaiter, banquet manager, sommelier, waiter, bar manager, bartender, and others (The Culinary Institute of America 2001). This division between professional roles was prevalent until the end of the twentieth century. Few restaurants today have such a large workforce that the roles can be as distinctive and defined as they have been in the past (Jönsson 2012; Tellström and Jönsson 2018). Within the restaurant context, a large part of the craftsmanship has been rationalised and the demand for different skills is not the same as before (Lundqvist 2006). Changes in the need for competence have simplified several craft procedures, but it has also meant that simplifications have resulted in less variety of utensils used for table setting and serving. When the opportunity to choose among the restaurant's various utensils is limited due to a smaller selection, the risk of the waiter choosing the wrong material is minimised. With this kind of rationalisation, the waiter does not need to be attentive about what size, for example, a fork will be. On the other hand, by reducing the number of utensils, the risk-taking could also rise if the restaurant's atmosphere cannot meet the guest's expectation. Craft theorist and carpenter David Pye discusses the meaning of skill and emphasises that risk taking is central to the performance of crafts (1968). Workmanship of risk is characterised by unprecedented work, where the quality of work can be risked in pursuit of a more developed result. On the other hand, workmanship of certainty illustrates that work is performed on the basis of a security, is automated, and the result is predetermined (Pye 1968, 20–24). Simplifications and risk minimising can, however, mean that a part of the craft is lost and the practice is degenerated. The waiter's craftsmanship that takes place through a flow of actions in the placement of furnishing, table setting, and serving, and which consist of both tangible and intangible aspects, needs to be carefully investigated.

METHODS AND MATERIAL

Through my own long professional restaurant experience and with support of theoretical concepts and in dialogue with other researchers, I seek research methods that help me to research my own practice and related craft skills. In this study I used the methodology of case study to collect material from a craft science perspective, with analysis methods from time geography (Hägerstrand 1970) and three-dimensional visual analysis (Akner-Koler 1994; 2007). A craft science approach means that the researcher who examines the craft has the skill and knowledge required to perform the work that is being studied (Sjömar 2017). The method to use one's own experience as a starting point or as an example of general research is called autoethnography (Chang 2016). The autoethnographic researcher interviews and observes himself and is both subject and object in the study (Ehn 2014). This study has an autoethnographic approach. It is in this capacity, as a craft researcher within a restaurant context, that I can attempt to define details of the craftsmanship and increase understanding of a waiter's knowledge also on a more general level.

A Case Study of a Meal

Based on my role as an expert waiter, I have over the years developed my professional skills to include meal design for large events. This means having responsibility for furnishing, setting tables, decorations, and serving procedures for large dinner events. The case study presented in this chapter draws on my experience as a meal event designer of an event entitled "A Forest Walk," hosted by the Ministry of Agriculture and the Federation of Swedish Farmers (LRF) in Sweden. The idea for the meal was to offer a taste of Sweden by serving food from different agricultural products produced by Swedish farmers. The goal that the client had given me was to offer the international guests the opportunity to get a taste of Sweden. The approximately 350 guests were European Commissioners for Agriculture and other officials attending a conference. The themes for the conference, as well as for the meal, were climate, agriculture, and forest. The data for this case study includes only the reception, when the craft procedures such as the furnishing, table setting, and serving of drinks and canapés were performed. What happens after the reception, when the guests sat down and were served an appetiser, a main course, a cheese course, and a dessert, is not included here. It is my archival materials and my experiences from the meal which are gathered and analysed. As example, listed below are the source materials from the meal event "A forest walk":

- Seven photographs (of a total of 20 photos). The photographs were taken by a professional photographer.

- A conference brochure entitled "Swedish Farmers Invite You to Dinner" produced by the host Federation of Swedish Farmers (LRF 2009). Each guest received a copy of it when they sat down at the dinner table.

- My own work notes (approximately 70 pages of text, sketches, and furniture plans).

- An operational schedule, which was written by me. An operational schedule contains information about the following: menu, drinks, serving procedures, number of guests, etc. The operational schedule will help the waiters to furnish and set the tables according to the plan. It contains information about exact times for serving procedures—for example, when the main course is to be served. The operating schedule is distributed to the waiters before the preparation of a dinner.

- My own craft experiences as waiter and as designer of a meal event.

Methodological Triangulation

This case study was conducted in several parts, consisting of data collection, a time-geographic analysis, and a three-dimensional visual analysis. These were later combined in the in-dept autoethnographic analysis.

Time-geography is usually applied in interdisciplinary research in themes such as urban and regional planning, transportation, and communication (Hägerstrand 2009). Time-geography is also useful when studying the organisation and production of work, everyday life, wellbeing and household division of labour, and ecological sustainability (Ellegård 2019). Concepts from time-geography are here used to present the waiter's knowledge of time, room, and logistics. Time-geography illustrates that a craft procedure has been performed, as well as *where*, *when*, and by *whom*. Time-geography does not illustrate *how* something is done (Hägerstrand 2009; Ellegård 2019). This aspect is rather illustrated in the autoethnographic analysis. The formal-aesthetic dimension of the event is covered by the three-dimensional visual analysis which is a compositional taxonomy used in art and design education (Akner-Koler 1994; 2007). In her thesis, Akner-Koler presents a structure to distinguish form and room/space in our surroundings, and has since developed this in later work (1994; 2007). Her ambition has been to create a taxonomy that enables a dialogue about three-dimensional aesthetic composition on an abstract level. The three-dimensional visual analysis illustrates *how* the aesthetic dimensions appear in a single object or/and in a composition of several objects. During a period of approximately 10 years, a simplified version of the taxonomy, for three-dimensional visual analysis, has been applied in aesthetic courses on table setting for bachelor students in culinary arts and gastronomy (School of Hospitality, Culinary Arts and Meal Science 2020). The simplified version, under the name *aesthetic composition's concept*, has been used as a tool to describe how to create a meal design, including the food on the plate, the utensils on the table, and the furniture in the room. This is in order to direct a guest's attention towards predetermined parts of the meal experience. To understand the waiter's craft knowledge in the designing of a meal event in a more holistic perspective, concepts from time-geography and three-dimensional visual analysis have been combined. The term *holistic* here refers to taking both a logistical and an aesthetical perspective on the craft procedures.

INVESTIGATION OF THE WAITER'S CRAFT BY TIME-GEOGRAPHY

Events and procedures require both time and place in order to be carried out. The concept of time-space is central in the understanding of time-geography (Hägerstrand 2009). Time geographical key perspectives include the *individual*, the *activity*, and the *project* (Åquist 1992). An individual is a human or non-human physical entity present in a time period (Hägerstrand 2009). People perform a diversity of activities in order to create projects and thereby reach their goals (Hägerstrand 2009). In time-geographic research it is important to find out what enables and what prevents projects from being carried out (Ellegård 2019). The analysis of what is a *constraint* for a project is central in a time-geographical perspective (Hägerstrand 2009). The *constraints* are divided into three groups: *capacity*, *coupling*, and *authority*. Time-geography can enhance craft research (Eriksson et al. 2019) as the waiter's craft skills and vocational knowledge can be described and interpreted by the use of time-geographical perspective (Eriksson et al. 2019; Eriksson, Jonsson and Öström 2020).

During the time of planning a meal, an operational schedule is written. It contains information about the timing of serving, the kinds of drinks, the serving procedures, etc. The operational schedule is delivered as an instruction to the waiters before they start the procedures of furnishing and table setting. In this case, the schedule contained no descriptions of why and how the procedures were to be carried out or the purpose of the meal (Figure 1, section A). The lack of this information can be explained by the fact that the procedures carried out by the waiters are often a routinised tradition (Hedman 1999; Bokstad and Eriksson 2006; Ingelsson 2016), and also the fact that serving procedures are often done in a simplified way (Lundqvist 2006) and few assessments are made about alternative ways to perform them. However, from a craft research point of view, this unspoken information which is trusted to be implicitly understood by the waiters is interesting as it includes the knowhow of the practice.

I started the time-geographical investigation with the intention to detect the (for me) hidden information contained between the lines of the waiter's operational schedule (Figure 1, section A). I intended to capture this wordless information, lingering within and between the procedures and in the spaces before and after a performance—information which is never noted in the text and which is frequently taken for granted. Through my experience as being responsible for the event,

The waiter´s operational schedule of the case.	The waiter´s operational schedule of the case, interpreted by time-geography.	
	The time-geographical concepts – individual, activity and project.	The time-geographical concepts – capacity constraints, coupling constraints and authority constraints
A	B.	C.
A. 1. Instruction: serving wine and canapés.	B.1. **Individuals (physicals units) that are part of the time-space and that are needed to realise the project.** Approximately: 350 guests, 15 waiters, 2 headwaiters, 1 bar, 450 wine glasses, 4 buffet stations, 12 serving trays, 1600 canapés in portion holders, 1200 single use utensils, 600 napkins, 16 table cloths, 20 flower arrangements, 1 foyer, 1 consert house.	C. 1. **Capacity constraints thar occur at the drink stations and buffet stations.** In order to avoid long quesues: guests are offered only two beverages (alcoholic or non-alcoholic), and are served canapés from 4 buffet stations and from 12 trays. Buffet stations are placed in different parts of the foyer, and waiters are walking around the room offering canapés.
A.2. 8.00 – 8.45 pm Drink (white wine and apple juice is served from trays and by the bar). Canapés are being served from 4 different buffet stations and from trays.	B. 2. **Activities (procedures) that the waiter has to perform in order to realise the project:** find place for buffet stations. Place tables. Place table cloth and other decorations on tables. Set wine glasses in the bar and on trays ande serve drinks. Set out food on the buffet tables. Place canapés on trays and offer them to guests.	C. 2. **Coupling constraints that can occur when guests are socialising.** To avoid guests experiencing difficulties holding the glass while walking around and greeting each other, use glasses that are smaller in size, making it easier to carry. To avoid waiters not being able to move in the room with big trays while there are 350 guests in the foyer, emty trays are refilled in the foyer.
	B. 3. **Project (goal) that the waiter has to achieve:** that the guests can socialise in the foyer, greet each other, chat, drink wine, and eat.	C. 3. **Authority constraints that can occur at the buffet stations.** To avoid guests not helping themselves to canapés because that they believe more prominent guests must be the one to start, or believing that the canapés must be eaten in a specific order, waiters will offer food from trays as soon as the guests arive in the foyer. All of the different types om canapés will be offered at the same time.

Figure 1: Sections A, B, and C: The waiter's operational schedule interpreted by time-geography.

my extensive experience as a waiter, and the related practical knowledge within me, I began to reflect on the content of the procedures. Questions about where, when, and who are included in the examined procedures appeared before me through my interpretation of craft procedures to correlate with the following time-geographical perspectives: *Individual* (Figure 1, section B.1), *Activity* (Figure 1, section B.2), and *Project* (Figure 1, section B.3).

Under section A.1 in Figure 1, the "Instruction: serving wine and canapés" is a project created to achieve goals, which is the time-geographical definition of a *project*, thus I need to define which goals this project is supposed to achieve. One goal could be, for example, to allow the guests a chance to socialise (Figure 1, section B.3). Information about goals is often unexpressed in an operational schedule but is part of the knowledge that I possess both as a waiter and as a designer of the meal event. By using the concept of *activity*, which defines what activities needed to be performed in order to realise the project, different craft procedures were visible, such as table setting and finding the right places for the buffet tables (Figure 1, section B.2). By using the concept of *individual* (Figure 1, section B.1), it was possible to visualise further aspects of the craft knowledge, for example managing 15 waiters, 450 wine glasses, and 48 wine bottles. Through this identification, further questions could be raised about that which is invisible and that which is taken for granted—for example, how to handle 450 wine glasses.

When the *individuals*, the *activities*, and the *projects* had been identified, it was possible to provide additional information based on the three terms of constraints—*capacity*, *coupling*, and *authority* (Figure 1, section C)—and how I as a waiter and as a designer of the meal event planned and executed the craft procedures. Risks about capacity can be prepared for by having a well-equipped *mise en place* station. When wine has to be served to 350 guests, my long experience as an expert waiter tells me that long queues can pose a capacity problem. In order to prevent such queues from appearing, I chose to offer only two types of beverage, alcoholic or non-alcoholic, with the hope that this will lead to a quick choice for the guests, as they stand in the queue.

As an expert waiter, I have to be aware of which constraints could arise in terms of authority (Figure 1, section C.3), such as norms, culture, and who has the highest status within the context of the conference and, thus, may be offered wine and canapés first. Risks related to the social interaction between the guests are minimised through careful planning. When I plan a meal, I must analyse potential risks and limitations. I do so by thinking through various scenarios that might occur during the upcoming meal event. The gathered information tells me that there was no hierarchal order among the guests during the time of serving the cocktail. To avoid uncertainty between the guests about authority, I chose to serve wine and canapés directly to the guests when they arrived in the foyer.

INVESTIGATION OF THE WAITER'S CRAFT BY THREE-DIMENSIONAL VISUAL ANALYSIS

The crafting procedures and the design of the physical space—such as the furnishing of a dining room, the setting of tables with utensils, and the placing of food on plates—all generate three-dimensional spatial context. The result of these crafting procedures can be perceived in different ways by the guest. The waiter's craft and creativity can be compared to the sculptor's, as both practice the skill and the ability to pay attention to the aesthetic dimen-

Section 1. Elements and their properties	Section 2. Movements and forces	Section 3. Relationships	Section 4. Organisation
Deals with defining the basic visual elements and their elemental parts, dimensions and properties. Examples of visual elements of form and properties: **Four basic visual elements:** – Volume – Plane – Line – Point **3-D Primary Geometric Forms** – Cylinder – Cube	Means to analyse a concrete three dimensional composition perceived in the inner- and spatial activity of the elements. Examples of visual movements and forces: **Axis:** – Primary – Secondary – Tertiary	Are created between the properties of the elements and their movements and forces. Examples of visual relationships: **Order:** – Dominant – Subdominant – Subordinate **Comparative relationship:** – Similarities – Differences	Can be seen as a ”master plan” that maps out the routes and interactions between all visual aspects (i.e. Elements and their properties, Movements and forces and Relationsships). Examples of visual organisation: **Organisational framework:** – Static – Organic – Dynamic

Figure 2: A simplified version of the taxonomy of the three-dimensional visual analysis, with its four different sections (after Akner-Koler 2007).

sion of an object. In the field of Culinary Arts and Meal Science (CAMS), practical skill is combined with science and working methods with an artistic content (Gustafsson 2004; Gustafsson et al. 2006). In a similar way, different knowledge forms, including the aesthetical aspect, are linked together in the description of craft as the practical solving of problems through a skilful use of materials, technology, and aesthetics (Sjömar 2017, 96). This study thus has an aesthetic perspective, and according to Shusterman (1992; 2000), aesthetic is the understanding of the science of sensuous cognition. The word *sensuous* is defined as “fusion of our senses” and the word *cognition* as “to know” (Shusterman [1992] 2000). Furthermore, Shusterman states that the body is the locus of sensory-aesthetic appreciation and aims to enrich not only our abstract knowledge but also our lived somatic experience and performance (Shusterman 2012). Thereby Shusterman defined the term *somaesthetic*, seen as a framework to promote and integrate the diverse range of theorising, empirical research, and meliorative practical disciplines concerned with bodily perception, performance, and presentation (Shusterman 2012). Somaesthetic comprises an interdisciplinary research where body, mind, and culture

Figure 3: Wine glasses set on the drinks table. Photograph by Hans Lundholm.

Figure 4: The buffet tables. Photograph by Ragnar Lundgren.

could be seen as deeply co-dependent (Shusterman 2012). Akner-Koler (2007) based her research of aesthetic as a perceptual experience primarily on Shusterman's thoughts on a pragmatist aesthetic.

In this study, a simplified version of the taxonomy of three-dimensional visual analysis, with its four different sections, is used as a theoretical basis (Akner-Koler 2007). The four sections are: Elements and their properties; Movements and forces; Relationships; and Organisation (Akner-Koler 2007, 78–165) (see Figure 2).

The investigation consisted of examining the photographs taken at the dinning event. Pictures of the furnishings, table setting, and serving were analysed in order to test whether details or the holistic compositions of them could be described by the use of the concepts from three-dimensional visual analysis. For example, I tested whether I could find general forms, described by concepts, as visible objects/elements on the tables and if they may be interpreted as volumes with different properties such as cubes, cylinders, or rectangles. Below are examples.

Wine glasses set on the drinks table (Figure 3). The glasses from which the wine is served can be described, in a simplified way, as cylinders (Figure 2, section 1). The motif can be described as easy-to-read or it can be said that "not much is happening" in the composition of the table setting. This may be because the properties of the glasses (Figure 2, section 1) in terms of the form are similar (Figure 2, section 3) to each other. There is also no distinct hierarchical order (Figure 2, section 3) between the glasses. The composition, the setting, of the glasses lined up in parallel rows can be described as a static organisation (Figure 2, section 4). It is likely that a static setting of glasses will lead the guests to choose the glass closest to the table edge.

Figure 5: Glass objects on the buffet table. Photograph by Ragnar Lundgren.

Figure 6: Placing canapés on the buffet table. Photograph by Ragnar Lundgren.

The buffet tables (Figure 4). The motif can be described as the tables being very distinct in the room. This may be because their properties regarding form and space (Figure 2, Section 1) can be described as cubes. The buffet tables have a different form in relation (Figure 2, section 3) to the guests' properties (Figure 2, section 1). The volume of each table is distinct because of its properties (Figure 2, section 1) and contrasting black side panel in relation (Figure 2, section 3) to the bright floor.

Glass objects at the buffet table (Figures 5) and *Placing canapés on the buffet table* (Figure 6) show the buffet table close up. When analysing the motif in Figure 5, one might notice the glass vases first. This may be because the vases have properties (Figure 2, section 1) that are different in shape from standard vases. Attention to the vases is enhanced by the centred primary axis (Figure 2, section 2) which emerges through the shiny base in the centre of the table. The primary axis (Figure 2, section 2) is enhanced by the long and narrow flower arrangements. The properties (Figure 2, section 1) of the glass vases are enhanced by their relationship (Figure 2, section 3) to the table surface, which has similar properties (Figure 2, section 1) of glossiness as the vases. When analysing the motif in Figure 5, the static organisation (Figure 2, section 4) of the canapés is distinct.

Canapés set on the buffet table (Figure 7) appear both different in form and similar in colour. There are different properties (Figure 2, section 1) in the shape of the bowls in which the food is served: canapé A is served in a square dish, canapé B is served in a triangular dish, and canapé C is served in a cylindrical glass. But on the other hand, there are similarities (Figure 2, section 3) of properties (Figure 2, section 1) in terms of colour between canapé A and canapé B. Both of these canapés are different (Figure 2, section 3) in colour to canapé C, which is orange.

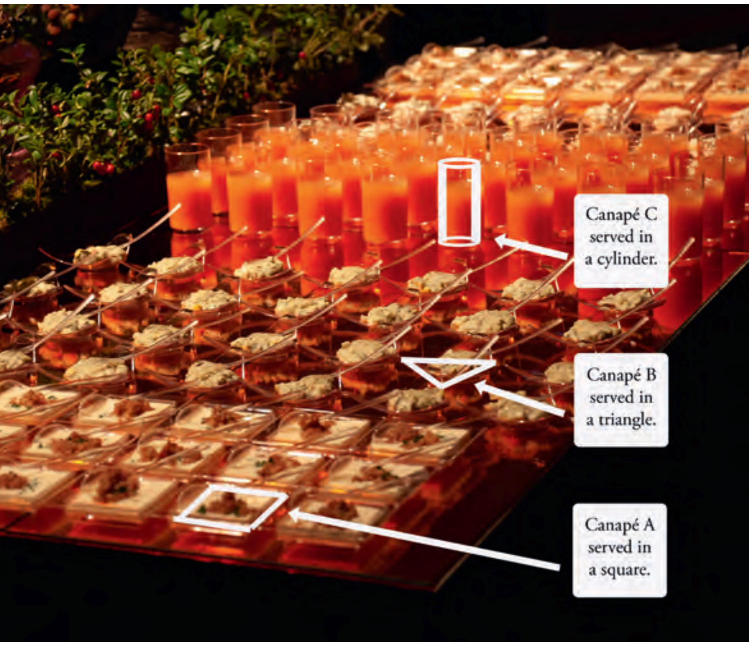

Figure 7: Canapés set on the buffet table. Photograph by Ragnar Lundgren.

Figure 8: The foyer. Photograph by Ragnar Lundgren.

COMBINING THE ANALYSIS OF TIME-GEOGRAPHY WITH THE ANALYSIS OF THREE-DIMENSIONAL VISUAL ANALYSIS

The first part of this study showed that through time-geographical concepts it was possible to verbalise the waiter's craft knowledge regarding time, space, and logistics of a meal event. The second part of the study showed that three-dimensional visual analysis may be used to describe the waiter's craft procedures from an aesthetic perspective. In this third part, I test whether a combination of these two parts together with my autoethnographic perspective based on my collective professional experience can support a verbalisation of my craft knowledge applied in performing the craft procedures of furnishing, table setting, and serving. Thereby, I will try to verbalise the craft knowledge needed by a waiter in designing a meal event. Some examples will follow:

> In order to avoid capacity constraints that could result in the guests not registering the buffet tables among the 350 guests in the foyer, I chose an aesthetical approach to attract attention to the tables. The square surface of the buffet table was enhanced by long, black tablecloths placed over the entire table that draped down to the floor, giving an impression of a solid black cube. The contrasting white floor surrounding the cube reinforced the bold contours of the cube, bringing the buffet tables to the attention of the guests (see Figure 8).

When the guests had registered the buffet tables, I wanted their attention to be directed towards the table surface where the canapés were located. As a meal event designer, I had the client's mission

Figure 9: The serving tray. Photograph by Ragnar Lundgren.

in mind, which was to enable guests to stay at the buffet tables for a long time and to keep them interested in and engaged with the food. Thereby, my ambition was to create the best conditions for the canapés in order to highlight the Swedish food:

> To bring attention to the table surface, I placed two rectangular copper-coloured surfaces on the table top to create a contrast with the black sides of the cubic table. In the same way, the copper colour was similar in colour and shades to the canapés (see Figure 10).

My role as a designer of the meal event also included choosing the bowls for the canapés:

> I chose a diverse range of individual items to set on top of the buffet tables. The individual items—the canapés, the bowls, the serving trays, and the decorations—can be described as having properties which consisted of many differences in shape, material, and colour. Different forms of the bowls increased the clarity of the different types of canapés that were offered, and helped guide the guests to separate canapés from each other. For example, the bowls were distinct geometric forms such as cubes, triangles, and cylinders. Thereby, it was my intention that it would take a longer time for each guest to explore everything on the buffet table. In collaboration with the chef, Christer Lingström, we designed each canapé to express colour and texture variation that would express different culinary experiences (see Figure 7).

The plan for furnishing the buffet tables in the foyer was that the taste of Swedish food, experienced through the canapés, would be possible to achieve at the same time as conversations were going on between guests:

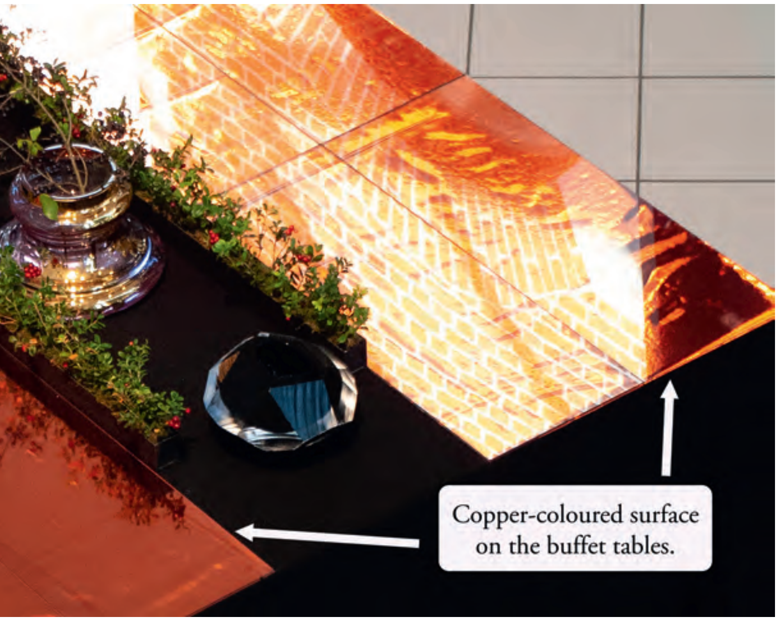

Figure 10: The buffet tables. Photograph by Ragnar Lundgren.

Figure 11: The foyer. Photograph by Ragnar Lundgren.

> In order to avoid capacity constraints which could mean that the guests did not reach the buffet tables and thereby did not get the opportunity to taste the Swedish food, I chose to offer canapés from trays. For the guest to understand that the trays were associated with the buffet tables and the food served there, the colour and decoration of them was the same as the colour and decoration on the buffet tables. The canapés were also set up on the trays in the same static organisation as they were on the buffet tables (see Figures 7 and 9).

My role as a designer of the meal event also included choosing the wine glasses:

> To avoid coupling constraints between guests and wine glasses, I chose a wine glass in a smaller size. The properties of the glass were characterised by it being easy to hold and not too large, which means that the glass could not be filled with too much wine. This was a conscious choice made to enable guests to walk with the glass and, at the same time, greet other guests (see Figure 11).

DISCUSSION AND CONCLUSION

The meal environment with all its physicality, such as the furnish in the room and the utensils on the tables, can be likened to "sceneries" in a "landscape," albeit on a smaller scale. The room in which the meal takes place is important for the guests' experience, but also the table setting is important and can itself also qualify as a room (Gustafsson 2004). When the guests arrive and interact with the meal, they will affect the room, the "landscape," just as the waiter will do. The physical material, such as glassware and china, arrive into the "landscape" through the waiters' serving procedures during the meal. Time is crucial for an experience. How long the glassware and china are in the dining room for before they will be brought away has an impact on how the restaurant experience is perceived. But aspects such as the point in time at which the waiter will serve the food will also have an effect. The waiter changes the environment, the small landscape, by his or her craft procedures for table setting and serving. The aim of this study was to investigate research methods that could be used for verbalising a waiter's craft in designing a meal.

When I, as a waiter look at the pictures, the time schedule, and other materials in this study, I can see, for example, that drinks should be served at a certain time, that the canapés are served from buffet tables and trays. As a skilled waiter, I am familiar with the presented situations and can thereby pass several layers of questions that an inexperienced person would first have to get answered in order to understand the material. This is in line with Almevik (2011), who points out that craft procedures have their own internal logic that can be difficult to detect for inexperienced individuals or laymen standing behind. With my knowledge of practice, I know which procedures must take place before anything else can be performed, as a craft procedure has to follow a certain order. If I, in the role of a waiter in a situation of preparing a meal event, were to study the material, my questions would have a logistical focus. What is to be done? Where can the white wine be cooled? Are the canapés hot? These questions need to be answered in order to perform the waiter's craft with the aim of achieving efficiency, ensuring quality, and a lot of other practical issues.

When I, as a researching waiter, look at the material, I ask other questions. The purpose of my questions, instead of ensuring production and quality, is to get closer to the knowledge which is tacit in the pictures, in the operational schedule, and in other materials in this study. It means paying attention to my own procedures and reaching for what is taken for granted, trying to answer *what I do* when I do it. The source material tells only a small part of the whole picture, therefore other approaches are required. I use research methods to get closer to the source material and categorise it, to analyse and interpret it in order to find the hidden aspects of the craft, which will take me closer to verbalising the waiter's knowledge.

In this study I have undertaken the research process in several steps. Throughout the study, my source has been my own experience as a waiter: first, through the perspective and approach of time-geography (Hägerstrand 2009), which gives a structure for capturing craft procedures over time in space; secondly, through the use of a visual language, a taxonomy, from the three-dimensional visual analysis (Akner-Koler 1994; 2007) which provides a structure that enables a dialogue of three-dimensional reality. Thereafter, I combined these two perspectives.

As a craft researcher, based on my significant craft experience as a waiter, I know that some of the restaurant's crafting procedures are more successful than others, allowing me to critically review crafting procedures in a case study. I find throughout the research process that the waiter, like other craftspeople, handles a number of different activities in order to anticipate and prevent risks that could be obstacles in the successful progression towards the planned goal.

Time-geography - Shows and Predicts Risks

When a craft procedure is linked to the time-geographical concepts *project*, *activity*, and *individual* together with *capability-*, *coupling-* and *authority-constraints* (Hägerstrand 2009), it is possible to distinguish the craftsperson's many different choices about risks in time and space that he/she is faced with, as discussed by Eriksson, Jonsson and Öström

(2020). The use of the time-geographical concepts enables a dialogue in a holistic way about the logistic parts of a meal event, discussed by Mossberg (2003). Through time-geography, the amount and the diversity of the waiter's judgements, according to *mise en place* (Jönsson 2012), will be made visible. This study shows that it is possible to predict a waiter's many different choices about risks in time and space by using time-geography in the analysis. This is supported by the results of earlier studies of craft researchers, regarding a gardener, a blacksmith, and a waiter (Jarefjäll 2016; Eriksson et al. 2019).

It is in the role of craft researcher combined with being a skilled waiter that I am able to discover the many choices and decisions which are taken in a craft procedure in order to predict risks, for example. This is in line with what Pye (1986) states about a craftsperson's risk taking and predictions of risk. In the same way, I, as a craft researcher with significant experience as a waiter, can understand that a waiter must make many different complex assessments at each step of a craft procedure to ensure its quality. This can be compared to Schön ([1983] 2013), who argues that professional practice includes complexity and uncertainty. This sorting and systematising, on a detailed level, by using the time-geographical concepts make the *logistical* parts in terms of the time and the room of the waiter's craft emerge in an enhanced way. By using time-geography, this logistical part of the waiter's craft can be verbalised as after-each-otherness and beside-each-otherness (Hägerstrand 2009).

Three-dimensional Visual Analysis - Shows Accuracy and Attention

By using the three-dimensional visual analysis (Akner-Koler 1994; 2007), this study shows that it is possible to identify and discuss a waiter's accuracy performed in his/her craftsmanship with the purpose of directing the guest's attention. When a craft procedure is linked to the three-dimensional visual analysis and its four sections (Elements and their characteristics, Movements and Forces, Relationship, and Organisation), it is possible to find and verbalise the waiter's conscious, but also perhaps unintentional aesthetic choices related to furnishing, table setting, and serving.

This means that it could be possible to extend the discussion of the tangible factors in a restaurant context, as Wood (2000) discusses, by using an aesthetic vocabulary. For example, Spence and Piqueras-Fiszman's (2012) discussion of the weight of a glass could instead be a discussion about the *properties* of a glass. Also Michel, Velasco, and Spence's (2015) discussion about colour on plates could be described as the *relationship* between different plates. In the same way, Sobal and Wansink's (2007) and Garcia-Segovia, Harrington and Seo's (2015) discussions about furnishing and table setting could be described as the organisation of the room as *static*, *organic*, or *dynamic*. It means that the waiter's craft knowledge about the aesthetic dimension of meal design can be discussed on an abstract level in line with Akner-Koler (2007) and thereby can be understood on a theoretical level instead of being looked upon as a mundane task routinely executed in a flow—something that Marchand (2016) mentions as a problem.

Further on in this study, the three-dimensional visual analysis has been expanded to also include the experience of colour, which is not included in the original taxonomy. Therefore, it will be possible to use the method of analysis to detect and describe a colour as a property. As an example: "the black buffet tables have contrasting properties to the colour of the floor." In this way, the taxonomy can be useful in restaurant research, where the experience of colour is of great importance to the guest's appreciation of food and drink, utensils, and furniture (Spence and Piqueras-Fiszman 2013; Michel, Velasco and Spence 2015).

This identification and possibility to discuss a craft procedure through the use of the three-dimensional visual analysis (Akner-Koler 1994; 2007) allows the *aesthetic* parts in the waiter's craft of furnishing, table setting, and serving to emerge in an enhanced way. By using three-dimensional visual analysis, the aesthetic part of the waiter's craft can be verbalised as properties, movements, relationships, and organisations.

The Multimethodological Approach Verbalises the Waiter's Craft in Designing a Meal Event

The waiter's craft procedures can be understood both as logistic organisations performed in order to avoid constraints between individual, activity, and project (Hägerstrand 2009), and as aesthetic dimension in order to distinguish and map out interactions between components (Akner-Koler 2007), i.e., furniture, utensils, and decorations. The waiter's profession is based on embodied, situated, and materially and socially mediated craftsmanship that requires many years of attentive and accurate practice to reach expertise and connoisseurship. By linking perspectives from time-geography, which provide information about risks and predictions, together with taxonomy of three-dimensional visual analysis, which provide information about attention and accuracy, it is possible to find both methodologies and terminologies in order *to verbalise* the waiter's craft knowledge.

This study shows that functions and materials for meal-design can, as Risatti (2007) writes, be seen to be so simple that they are forgotten, but they have significance. For example, how the glasses are set on a table can affect how long it takes for guests to enter a room. Lugosi (2008) states that a hospitable meal, for example, is a provision to fulfil basic needs, to create a shared, experiential space in which the guests become part of a social entity. But he will not explain how the craft procedures are to be executed for this wide range of hospitality; it is possible through a combination of methods from both time-geography and three-dimensional visual analysis.

Students at university levels have worked with a simplified version of the three-dimensional visual analysis, *the aesthetic compositional concepts*, in order to explain a design process in a meal context by focusing on the guest's perspective of a meal. The guest's perspective can be compared to Shusterman's (2012) concept of *somaesthetics*, as a lived experience where body, mind, and culture are deeply co-dependent through a performance. A meal event is a lived performance, experienced personally by each individual guest. When designing a meal event, the waiter and the student need to understand, according to Shusterman (2012), that every guest has their own body as a locus. The challenge in the designing of meals is to understand what a client and his/her guests expect. The waiter's craftsmanship consists of understanding and creating conditions for each individual guest, both logistically and aesthetically, and moving closer to the utensils and materials in order to be a part of the meal event.

The waiter's craft procedures are difficult to distinguish, but by using two methods with different scientific perspectives, it becomes possible to both distinguish and verbalise these procedures. The combination of research methods enabled a discussion about meal design performed through the waiter's choices of utensils, materials, and craft procedures. I want to point out that this study shows that it is possible to understand and link perspectives where logistics and aesthetic dimensions work together to direct the guests' attention. By leaning on expert knowledge of multiple past events, the meal event designer can anticipate risks and opportunities that might present themselves to the guests and can thus facilitate and direct the guests' attention and behaviour towards an interaction with the space, furnishings, utensils, and the offerings. The *aesthetic compositional concepts* can be seen as a tool for students, waiters, and other professionals within the restaurant arena. This tool can be used for further investigation, and as a way for communicating the intangible circumstances necessary for a meal experience—something that is demanded by Finkelstein (2004) and Stierand and Wood (2012). Through a use of *the aesthetic compositional concepts*, both the aesthetic dimension (which describes *how* something of the waiter's craft can be verbalised) and the logistical dimension (which describes *that* a craft procedure has been performed, and *where*, *when* and by *whom*) can be verbalised. However, I found that the most important contribution of this study was the combination of methods of analysis in order to verbalise a waiter's craft knowledge of the process of designing a meal event.

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Johan Knutsson is Professor at Malmstens Linköping University. He received his PhD in Arts History in 2001 on the dissertation Tradition och egenart. Folkliga möbler, where he investigates the design, sources and making of vernacular Swedish furniture. As teacher and researcher in furniture culture his attention is directed towards techniques and materials, elements of special relevance to his students in furniture design, furniture making and upholsery. From 1981 to 2009 he was active at several museums, curating exhibitions, making research, holding lectures and publishing books in the field of craft, design and applied art. The cooperation and interaction with conservators and students as well as craft people transmitting traditional skills as intangible cultural heritage has encouraged and influenced his actions in both museums and the university´s spheres.

KEYWORDS: Art technology, Heritage science, spectroscopy, connoisseurship, folk arts and crafts, cultural heritage and sustainability

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Exploring Folk Art in Historical Interiors

By Ingalill Nyström, Anneli Palmsköld and Johan Knutsson

INTRODUCTION

In 2012 the World Heritage Committee (UNESCO) appointed seven decorated farmhouses in the region of Hälsingland as Sweden's fifteenth World Heritage Site. At the same time and with financial support from the Swedish Research Council, a multidisciplinary research group was established with the intention of exploring the decorative folk arts and crafts in the farmhouses of Hälsingland. The project, which was located at and directed from the Department of Conservation at the University of Gothenburg, was concluded in 2019. Its purpose was to investigate these interiors, analysing and interpreting them by using methods among which many are closely related to the field of craft science.

This article is about how we performed a holistic research study of decorated folk art interiors dating from 1750–1850, combining art-technological, conservation, and craft scientific perspectives. The aim of our research was to map and unfold the craft techniques and manufacturing processes, as well as the artist's and craft materials in wall paintings, painted furniture, and patterned textiles. The purpose of doing so was to gain information about prevailing conventions and social networks within a geographically defined territory in the central part of Sweden within a defined period. We use Art Technological Source Research (ATSR) combined with scientific methods as an approach, developed within the field of conservation science, in order to understand an object, its context, and the period when the object was created.

In ATSR, sources of different kinds are combined (cf. Nyström 2012). The sources can be the object itself; realia (i.e., tools used in the craft and manufacturing process); secondary and primary information from the craftsperson (i.e., prescriptions, illustrations, and other descriptions); and contemporary information that contributes to the understanding of the context, such as manuals, taxae, and other recent research findings on the subject. ATSR also encourages the implementation of reconstructions to better understand the craft and manufacturing processes, the material used, and the object itself. Using ATSR resonates with the multidisciplinary point of departure for the research project. The approach made it possible to combine methods used in conservation science, humanities, and craft science, and to critically engage in the different analyses that were carried out. ATSR is a method that was developed as a criticism against research only focusing on one thing, for example cross section analysis, historical sources, or art historical based research. By using the folk art objects in Hälsingland as a point of departure for the research project, it has been possible to make a holistic analysis that truly combines natural science and humanities.

Making reconstructions is closely linked to the method of "Authentic Processual Reconstruction" in which the researcher tries to reconstruct the craft processes and the craft situation in order to achieve an authentic picture of how an object was manufactured (Almevik 2012, 54). A similar method is used within archaeology and is called "experimental archaeology" (cf. Nyström 2012, 21f). However, in the case of experimental archaeology, it is rare that written sources and original texts are available. In addition, the archaeologist who explores the techniques is in some cases not a craftsperson or trained in craft skills. Thus, without written sources and original texts, there is more of an experimental situation. But even in cases where historical written sources such as recipes and descriptions are available, it can be difficult to understand precisely how the process was performed (Nyström and Roxvall 2018; Palmsköld and Fabler 2018). This is due to the fact that general knowledge and, at the time, widely spread knowledge—for example, tacit knowledge, smell, and appearance—had often been omitted from the written texts. Such common knowledge can also be about specific moves and operations that need to be performed in different situations and at different stages of the craft process. This knowledge can be crucial for understanding and interpreting a craft and manufacturing process. When it fails, the reconstruction may be very difficult and can therefore require repeated attempts. Therefore, in craft science it is crucial to test different processes and techniques by performing reconstructions to understand a craft and manufacturing situation. Although this has not been a main topic in our project, our collective practical experience (formerly accumulated) in the fields of painting and textile has been crucial in our understanding and interpretation of the results.

Investigating historical objects as a starting point for the analysis and interpretation is common in some humanistic fields. Textile researcher Pernilla Rasmussen shows that objects as historical sources can offer opportunities to answer different questions, but also, in turn, generate new questions due to new facts (Rasmussen 2010, 20). She emphasises the importance of using many different sources together, to gain increased knowledge. Referring to the folklorist Henry Glassie, she writes that "the objects contain meaning not formulated in written material but left in the tracks" (2010, 19). Starting from texts alone as source material inevitably means that many dimensions are missing. Ethnologist Marianne Larsson emphasises the importance of being in touch with the objects, actively recording the perceptions of mind that the object gives—that is, to taste and feel them (Larsson

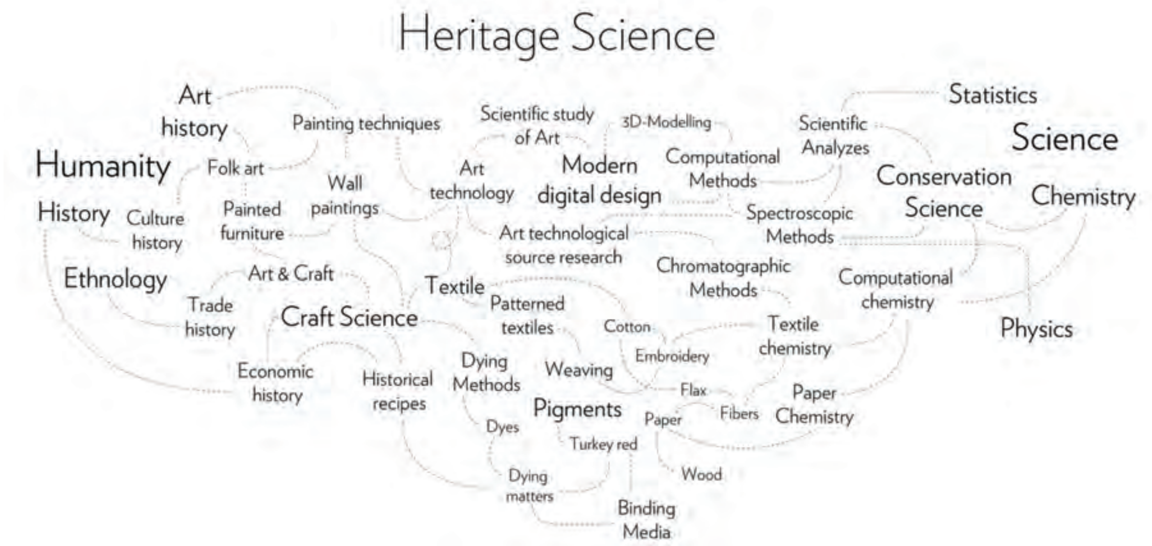

Figure 1: Starting from a comprehensive, holistic perspective in a research project within the field of heritage science involves using a combination of different perspectives, study materials, and methods. The example shows how a research project on folk art in historical interiors has been investigated. Illustration: Jonathan Westin.

2008, 31). One way of describing the method is to speak of "tactile vision,"[1] a term used by ethnologist Charlotte Hyltén-Cavallius (2007, 26). Attending to objects in this way opens up the opportunity of a deeper understanding of materials, techniques, and manufacturing processes. This is also something that happens in conjunction with a preservation situation. The conservator handles and touches the object, disassembles it, and documents it with the help of different lights, cameras, and filters. This helps the conservator to understand the construction, the raw materials, and any damage to the object in order to be able to perform the correct conservation treatments. The conservation processes thus occur over a long period of time and require close proximity to the object.

Scientific methods used in conservation science can help to deepen both the art technological research and the craft scientific research. In order to understand the craft and manufacturing process, the construction, and the material content, different types of analysis can be performed. This will help the researcher to see various layers in depth, at both the micro and macro levels. Such information forms the bases of material cultures, a field formulated by Anglo-American scholars in the 1970s and primarily directed towards anthropology, archaeology, and art history. The analysis and interpretation begin with an overview—that is, with observation and examination of the object at a macro level. This involves the use of technical equipment, special lighting, filters, and cameras, as well as a microscope. The actual material characterisation of the objects is then performed through various chemical and spectroscopic analysis. Even the historical recipes can be critically analysed using natural science in order to understand the various chemical phases in the making processes (cf. Palmsköld and Fabler 2018). In other words, when studying the object at both a macro and a micro level, the understanding of the object increases.

In our research, we are moving within the field of heritage science, where we adopt a comprehensive, holistic approach to the cultural heritage field. In Figure 1 we present an image of the perspectives, materials, and methods that can be activated within this complex field. Thus, we use different perspectives to answer the research questions, derived from both humanistic and natural sciences. In the following, we will describe and discuss the variety of methods that we use in our research. We will be focusing on object analysis and style-historical analysis, connoisseurship analysis, reconstructions, and scientific analysis, and we give examples of results we have come up with by using the different methods.

OBJECT ANALYSIS

Using objects as a historical source and starting point for the analysis requires a wide use of different sources to gain increased knowledge. From a heritage science perspective, the first step is to analyse the object itself, to note the physical characteristics as they appear to the researcher. Materials, craft techniques, the use and reuse of the object, and aesthetics are all points that are considered. The interpretation is made during a process when the researcher is using his or her senses to determine which kind of object is in focus for research (cf. Palmsköld 2007; Pink 2009). This can be done by, for example, carefully looking at the object from different angles (vision), by smelling it, by touching it (sensation), and by listening to how it sounds (hearing).[2] The physical characteristics are documented in words and using visualisation techniques.

The next step when analysing an object is to look into the contemporary and historical context. The folk art objects[3] in focus for our research project are in the possession of museums, homestead museums, and individuals. In the case of historical collections at institutions and non-profit associations, the objects are labelled, registered, and catalogued, and the data constitute an important part of the information and knowledge about them (Palmsköld 2007, 37ff). Previous and current ownership conditions are important pieces of information that are noted, as well as any conditions associated with the circumstances under which the object has been collected. The object's previous ownership testifies the networks it has been a part of. But the records are also a way of adding information that is not apparent from the object itself. In the case of private owners, the same kind of records seldom exist. On the other hand, there may be relevant oral or verbal information about the history of provenance and about the context that the object has been part of which may also be supplemented with genealogical data. In both cases, complementary information can sometimes be found in images and art works, where the objects have been visually interpreted and represented.

When the object has been documented, the written and oral information available has been noted, and images are added, the analysis will continue. Frequently asked questions may refer to:

- Materials, manufacturing and craft techniques and processes
- Function/use (use and reuse)
- Shape, design, and decoration (aesthetics)
- The context, origin, and history of the object (including its different values in the context they have been part of).

The analysis can be completed using natural scientific methodology, for example using microscopy to determine which fibres are part of a textile, or chemical analysis can be performed to understand which binders and pigments have been used in a painting. The aggregated documentation forms the basis for ongoing analysis and interpretation—in this case, an interdisciplinary approach that allows multiple perspectives. In this context, knowledge and experience in practical skills are of importance to help to find reasonable conclusions.

One example of how object analysis has been used as a method in the research project is connected to the textile craft technique of crocheting. This is a technique that has not been studied as thoroughly as other lace-making techniques, and how it was practiced in a Swedish context is less known. However, it is known that a crochet pattern was published in a Dutch magazine in 1824 (Palmsköld 2017). When analysing and documenting interior textiles in Hälsingland, two examples of white cotton lace made by crocheting were discovered. One was marked the year "1827" and the other was marked by the letters "MED". By using the letters, it was possible to identify the owner of the textile and it could be dated to before 1815 (Palmsköld 2017). In both cases the objects were analysed to establish whether the two pieces of lace were primary or secondarily attached to the main textile.

STYLE-HISTORICAL ANALYSIS

Within art history, style-historical analysis has been used for dating art objects. The method has primarily been applied to those objects that follow a normative style development—that is, the style chronology that was designed for Western art history in the late 1800s and early 1900s. However, using it as a source to determine the dating of folk art objects may be misleading. In previous research, the term *retardation* was used to describe how folk art objects were formed with a certain time lag. This way of describing aesthetics within folk art contexts reflects a view of the folk artist as ignorant and unaware of modern styles. As a consequence, earlier research has disregarded the aesthetic considerations that folk artists used in their creation. Thus, it may be more relevant to talk about style combinations and style anachronisms (Knutsson 2001).

Another influential idea has been the conception that new styles, fashions, and aesthetic solutions sank down from the elite to the lower layer of society. This layer was not considered to fully grasp how the styles should be applied in a "correct" manner. Researchers in the early-twentieth century labelled it "sunken cultural goods" (from the German concept of "*gesunkenes Kulturgut*"), leaking from a superior and exclusive level of society to an inferior and broader one, and saw it as a tendency for folk artists to imitate something without actually succeeding. Both concepts—style retardation and sunken cultural goods—have long since been abandoned by researchers, but are visible in older interpretations of folk art in literature.

However, there are occasions when the style-historical analysis as a method generates further insights and information in addition to the possibility of credible dating. Through this, attention is sometimes given to details such as the costume and hair fashion of the pictured figures, which otherwise might be overlooked if the object had been provided with a carved, stamped, or embroidered dating. Style-historical analysis can show how the craftsperson or artist relates to his or her inspiration sources—freely, independently, and yet consciously. Thus, it can tell us something about the artistic work and the individuality of the artist. The adoption of Rococo ornaments in an otherwise Renaissance Baroque work of art, such as one of the interiors by Gustaf Reuter (1699–1783), confirms that the rural painters—far from what is frequently supposed—often acted in accordance with current taste.

CONNOISSEURSHIP ANALYSIS

In both object analysis and style-historical analysis, deep and broad knowledge, familiarity with the material, and "a large experience of large amounts of objects that together build a specialist knowledge" are required (Rasmussen 2010, 20). This is usually referred to as connoisseurship and can provide better opportunities for identification and attribution of works of art to a specific artist or artist's group(s) (Knutsson 2001). The connoisseurship can be described as a specific knowhow or professional skill that is based on many years of experience within the field. This means that the connoisseur has seen a large number of works and observed specific details that help him or her to distinguish works by one artist from the works by another. A connoisseurship analysis can also involve recognition and comparison between different designs, technical solutions, and material choices. The analysis may sometimes give indications of an artist's education, the economic conditions of the client, and other economic and geographical factors which in turn affect technology, materials, performance, and quality.

Criticism has been raised against connoisseurship analysis, stating that it can appear subjective and is based on some kind of intuition that the connoisseur holds. Therefore, it is said to be difficult to scientifically argue for the conclusions drawn. However, this statement may be questioned. On the one hand, we must not neglect nor exclude or reject the connoisseurs' judgement due to the fact that it is not explicit enough or expressed in words. On the other hand, we have to consider that information of this kind has to be articulated in a way that is accessible, apprehended, and possible to review by others if we want it to be continuously communicated and accumulated. As a matter of fact, this "tension between the explicit justification required by research and the tacit appreciation and judgement that expertise and connoisseurship entail" have recently attracted attention in the field of design research and craft science (Nimkulrat, Niedderer and Evans 2015).

In our project we use connoisseurship analysis to define and describe the work of an individual artist or works from a geographical area or connected to a certain interior, then to identify details crucial for the attribution of an anonymous, unsigned painting, furniture, or textile to a particular named person or artist. In painting, for example, connoisseurship can be about the manner or the individual personal design of numbers and letters. Today, through digital image banks, we have more opportunities than ever before that allow comparisons of a large number of objects. Similarly, we have access to databases and the results of genealogical research which help us to establish relationships between craftspeople or artisans and the places where they worked.

In addition, there is another factor that has been of particular importance in our research. Our aim has been to primarily focus on signed works of arts and handicrafts (cf. Nyström 2012). By chemical material characterisation of signed painted works, the results in combination with connoisseurship analysis can be used for a more secure attribution. By doing this, artist's raw materials and specific painting techniques can provide new knowledge that altogether gives a more comprehensive picture of the artistry and its context. The analysis of artist's materials and techniques helps us to strengthen or reject the previous attributions with more credibility than if we were referring only to style-historical analysis and connoisseurship. The painters Olof Henriksson, Hindriks-Olle (1793–1861), and Anders Erik Ädel (1809–1888) were both active in the northern part of Hälsingland, creating decorative interiors in similar manners, the one being closely related to the other. The material analysis confirms that the latter, whose activities exceeded the former for several years, carried on his craft with access to a greater number of pigments.

When connoisseurship analysis is applied as a means of evaluating the quality of skills and artistry and to describe the craft process behind a work of art, it is important that the curator or scholar who is performing this analysis shares the experiences of the materials and practices used by the artist or craftsperson that is to be studied. Likewise, connoisseurship as a means of identifying the artist or craftsperson behind the work of art whose identity is not known is dependent on the curator's or scholar's own insights into the practice of craft. Whatever the objectives, connoisseurship is a method that requires deep understanding of materials, techniques, and processes. The relationship between expertise, connoisseurship, and experimental knowledge in professional skills was highlighted by the special interest group in experimental knowledge as a theme at the international conference "Knowing Inside Out—Experimental Knowledge, Expertise, and Connoisseurship" held in 2013 (see Nimkulrat, Niedderer and Evans 2015).

A painter's personal style, manner, and expression depend on raw material choices, the use of technique, and the choice of motif, as well as the artist's influences, conventions, and education. They also depend on the painter's experience, skill, driving force, temperament,–and choice of composition and repertoire. This is evident in, for example, folk art from Hälsingland, which combines different motifs, repertoires, techniques, tools, and the use of figurative freehand painting with non-figurative stencil technique and premade wall papers, giving great opportunities for varying visual expression (Nyström et al. 2018). It may also be possible to detect a personal manner in painting, woodcarving, and free embroidery. However, it is significantly harder in bound techniques like weaving. But even where bound techniques are concerned, there is a possibility of observing individual features. Since folk art painters, wood craftspeople, and needle workers did not usually sign their work, the identification of the craftsperson could be established by means of the personal style that the connoisseur is able to identify and put on display how works of art and handicrafts that at first sight seem similar, may be traced back to different persons. In all these cases, the interpretations and the analysis are based on knowledge of the craft techniques that are present in the work of art. To be able to identify how the craftspeople have worked, the choices they have made in every procedure are of importance if one is to be able to recognise the individual artistry. Familiarity with the techniques used to create the object in question may promote and support the identification of an artist's or craftsperson's specific manner and separate it from those of others. It is easier to detect the individual's sign when you are deeply experienced in the handling of the tool. The way in which the brushstrokes of the painter Anders Ädel differ from those of Hindriks-Olle in the interior of Jon-Pers, Ljusdal, is hardly discernible unless you are familiar with the practice of painting (Assis 2017).

By highlighting the various individual styles, the knowledge of who has done what is accumulated. The driving force behind the method of the connoisseurship analysis is the will to find and identify a specific named and traceable artist behind the work. In this way, the contemporary cultural and economic value of the work increases, thus establishing a basis on which the objects are to be more appreciated and better preserved. However, the current economic value is primarily related to furniture and fine art paintings, rarely to textiles (cf. Palmsköld 2005). The detection of the personal style reminds us that painting and textile production and other works of folk art have been practiced and developed by individuals—not by a collective, anonymous mass of people with a common "temperament," as has previously been claimed by a number of scholars—although several individuals already in the 1920s were highlighted by more advanced researchers in the field, like Sigurd Erixon. Furniture paintings by Jöns Månsson (1809–1888) contain details exclusively developed by this skilled craftsperson imitated by other painters, although none of them reached the same level of skill.

Connoisseurship analysis as well as material characterisation or art technological analysis rarely suffices as evidence of who did what. Recently, the network of painters in a specific area in Hälsingland during the 1800s has been identified (Assis 2016). It seems as if painters have collaborated with one another, rather than competed. For example, a painter may have been assisted by another painter to complete an assignment. This complicates matters related to attribution. Several painters may have dipped the brush in the same colour, using the same stamps and stencils. If they have painted in the same room, they have also adapted closely corresponding motifs and styles to create a uniform expression.

A connoisseurship which is based on a combination of written sources about the provenance, scientific research on artists' materials and art technology, and the knowledge of the craftsperson's and artist's personal manners and the choice of motifs, patterns, and working techniques, has the greatest chance of success. However, the connoisseurship and the style-historic analyses, which are part of the object analysis, are only part of the overall assessment of an object.

RECONSTRUCTIONS AS METHOD

Connoisseurship analysis is not only closely related to the experience of practical activities; it is also connected to reconstruction as method. Reconstructions of historical craft processes, painting materials, and authentic objects are made using historical sources, realia (such as painting tools), and original documents (recipes, manuals, drawings, and sketches). The reconstruction processes help to better understand craft processes and the various results of them. "What are the crucial points in the processes?" and "How can hand grips, choices of tools, and materials affect the outcome?" are examples of important questions to ask.

In our respective pieces of research, we initially sought to find original texts describing the historical use of various dyes and pigments, as well as authentic recipes (Olars 2015; Palmsköld and Fabler 2018; Nyström and Roxvall 2018). These texts have provided the basis for producing references,[4] dyed textiles, and paint which have then been used for the various chemical analyses (see Figure 2). Reconstructing pigments, dyes, or paint based on historical prescriptions and painting manuals is a commonly used method in conservation research (cf. Nyström 2012). In this way, painting techniques and material content in an art work or object can be understood in a more profound way. Even the chemical analysis will be easier to interpret and understand if a reconstruction of a craft process has been made. Thus, it requires both a craft science ap-

Figure 2: Examples of reference samples produced in the project. Woad-dye samples, woad pigments, and a sample of dyed textile. Photograph by Ingalill Nyström.

proach and a heritage science approach to carry out technical art studies. In the process of a reconstruction, the scientist gains a personal, practical craft experience of how materials behave when applied, and how tools act when handled—experiences providing him/her with the skills necessary to interpret and evaluate the analysis of materials and traces of tools, and to identify the individual style of any painter or textile worker on a connoisseur's level. In other words, an awareness of the way in which varying materials behave offers a better insight enabling an interpretation of the labour process behind the object examined. Having the relevant practical experience of applying glue paint to the surface, and in what way this application technique differs from the one which is required to apply linseed oil paint, may assist the observer in describing and considering the prerequisites and situation at the time and place where interior decorations such as the ones by Gustaf Reuter in Hälsingland were executed. Even though reconstructions have not been part of this project, we all are very familiar with the method and have used the perspective "think like a craftsperson" as a point of departure. Ingalill Nyström and Johan Knutsson have deep knowledge in practicing painting using historical techniques and materials. Anneli Palmsköld likewise has much experience of studying and practicing different textile techniques.

SCIENTIFIC METHODS AND APPROACHES FOR THE OBJECT ANALYSIS

Interpreting the results from chemical analysis requires more than experience and expertise within the field of analysis itself. It is also important that the researcher who interprets the results has artistic or crafts knowledge, as well as knowledge in conservation or heritage science. For example, in order to be able to interpret the results of a binder analysis, knowledge of historic binders and knowledge about the chemical constituents of the binders is required, otherwise misleading conclusions may be drawn and important facts that the artist or craftsperson had to take into consideration may be disregarded (Nyström 2021a; 2021b; cf. Fors and Isaksson 2018).

When choosing a scientific method from a conservation perspective, non-invasive methods are preferred because you do not have to take samples from the objects that are in focus for research and analysis. This is especially important when working with objects that have been appointed as rare and unique pieces of cultural heritage. In our respective research, with some exceptions, we have mainly been using non-invasive methods, especially during fieldwork in interiors and collections.

The scientific methods we have used in analysing the materials and techniques for further interpretations concerning the social context and aesthetic preferences of maker and user are based primarily on different spectroscopic methods. Spectral methods are based on different types of light, also referred to as electromagnetic radiation (see Figure 3). In conservation and heritage science, the methods are common and used for gaining increased knowledge of the material content of the objects, the stratigraphic layers, the construction, and the manufacturing technique. Light can also be used to see changes and later additions. The results form the basis for decisions regarding possible and relevant conservation treatments, but can also be used to describe an object technologically and qualitatively.

The analytical techniques used are mainly Multi Spectral Imagine Technique, X-Ray Fluorescence (XRF), Dispersive Raman, Fourir Transform (FT) Raman, Direct Sampling Analysis-Time of Flight-Mass Spectrometry (DSA-ToF-MS), Fourir Transform Infrared Spectroscopy (FTIR), and Gas Chromatography with Mass Spectroscopy (GC-MS). Multi Spectral Imagine Technique, XRF, and Dispersive Raman are non-invasive methods that can be used directly in the field without taking samples from the object.

Multi Spectral Imagine Technique is initially used to identify original surfaces and to get a first structural indication. XRF is used to identify the elements in pigment and thus get an initial indication of the pigment used. Dispersive Raman can be used in field and in labs for pigment and dye analyses. Additional dye analyses have been performed with FT-Raman and DSA-ToF-MS in the laboratory. Analyses of binders in the paint are mainly made by destructive analyses, where the sample is destroyed. However, FTIR may be used for a first indication of binder. To get a more comprehensive and secure indication, the analyses have been performed in the laboratory. We have combined FTIR with GC-MS in a step-by-step analysis. First, we use FTIR to establish whether the binder consists of protein, lipids, or polysaccharides. After that, we analysed the lipids, which are fats in the binders (Fors and Isaksson 2018). The analytical methods used in our project are described below in a brief and simplified manner. For example, the analyses confirm that the paint used for wood in our cases normally contains vegetables lipids, an observation which also matches written sources. In some instances, the paint is based on tempera, which is normally the case on cupboard interiors. Wall paintings on textiles often contain tempera. In terms of the pigments, our analyses confirm that mostly okra and vegetable pigments were used during the eighteenth century. During the nineteenth century, many new pigments have been adopted, such as massicot, yellow, and Schweinfurt green.

The first step in an examination of a painted object is ocular inspection. It is carried out by means of simple spectral techniques. This first analysis of the object is usually called an *overview analysis* and provides information on the original layers and later additions on the front and back sides (Nyström 2012, 35 ff). Even indications of techniques, construction, material content, and stratigraphy of the object can be obtained. Normally, visible light

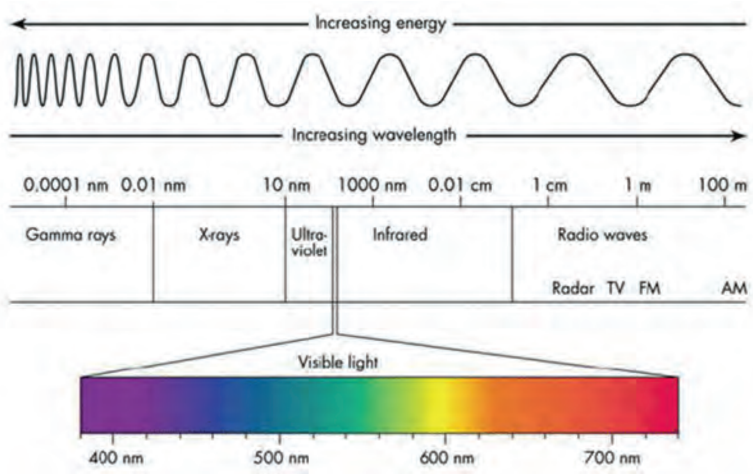

Figure 3: DThe electromagnetic field. https://www.hemma-odlat.se/odla/fotosyntesendel-1/ [2019-10-10]

is used, with a wavelength between about 400 and 700 nm (see Figure 3), and a camera for documentation. The light may be dispersed or more collected. The light source is placed at an angle of approximately 45° on each side of the object to avoid reflections in a glossy flat surface. Light from behind an object, such as a painting on canvas, can reproduce the transmitted light, where holes, tears, and sparse structure can become more visible. With raking light, the structures of the surface (for example, impasto paint layers) can become more visible.

In addition, further light sources in other spectral areas can be used, combined with filters and camera, to document what might otherwise be invisible. Ultraviolet (UV) light, with wavelength bands between 320 and 400 nm, which is close to the visible violet light along with a special filter that only permits reflected UV light, can be used to see surface structures like the trace of a brush in varnish. UV light can also be used to view UV fluorescence. This means that materials that are fluorescent in UV radiation give specific bright colours. To be able to photographically document the UV fluorescence, a yellow filter that filters off the UV and violet radiation is needed to make the specific colour of fluorescence more distinct. Certain pigments have specific fluorescent colours, thus indicating which pigments may be included in the paint layers. Likewise, later additions such as retouches and over-painting may become visible due to the fact that aged material generally fluoresces more. Later additions appear as dark, purplish areas or stains. It was easy to state that most of the interiors attributed to the famous painter Gustaf Reuter have been seriously tampered with, for example—an observation pointing towards the fact that works by this painter have been cherished by prosperity.

Another light source such as near-infrared (IR) light can be used to get further information about the underlying layer of the painted surface. IR is the same as heat radiation, whose wavelength is between about 700 and 1250 nm. This light, together with an IR filter that shuts out all visible light, can detect underlying sketches, provided the superimposed paint layers contain pigments that transmit IR radiation. Additionally, good contrast in the sketch is needed. For example, a lead-white-containing paint layer on top of a carbon drawing on a chalk-white ground gives good images of the sketch when using IR. In the actual project, the free sketching technique of Gustaf Reuter could easily be explored. In addition, composition lines that had been drawn with a graphite pencil could be identified.

Following the overview analysis, further analysis can be performed using more advanced spectroscopic methods. Some analyses can be performed directly on the object using portable instruments. If additional samples are required for further analysis in the laboratory, samples of approximately 1 mm in size are taken from all original colours or colours of interest. The samples are preferably taken near lacunas and losses, or in places where the loss causes the least harm. The overall impression of the paint and finish of the object must be preserved and must not be put to any risk of failure. Each sample area is documented by photos and recorded in a sample form with a short object description, as well as information about the analytical methods.

All analyses that have been performed and samples taken are registered in a database. The database that proved most suitable for the project was the KD-Tools database system, designed for Architectural Paint Research investigations of buildings (Edvardsson and Verweij 2016). Each investigated object received its own registration number. All analyses performed on site and the samples taken in a sample series from each object are marked on a photo of the object (see Figure 4).

The advanced spectroscopic analysis methods are also based on light beam technologies that interact with materials in different ways. Usually, special detectors and other devices are combined with the light source to interpret and record the emitted or absorbed photons/electrons. For example, infrared light can be used to investigate the functional groups in organic substances such as binders and dyes. Functional groups with dipole bonds absorb energy from the light source, and they begin to vibrate. The reflective or transmitted light that occurs has lower energy and can be split up and separated using special gratings in an infrared spectrometer. With a detector, the different light waves can be recorded as a spectrum specific to the different functional groups in the paint layer.

By means of X-ray, the elements of, for example, inorganic pigments can be analysed. However, X-ray has high energy and is thus hazardous, which is why special equipment with an electron detector is required. When using an X-ray fluorescence instrument, the X-ray's electron beam sweeps over the surface to be analysed. Fluorescence—lower energy electrons—is emitted from each point on the examined surface. The emitted electrons can be detected by means of an electron detector. The different energy lines specific to each element are recorded. The technique gives an indication of possible pigments in the paint layer.

Laser light can also be used for pigment analyses. Laser is a monochromatic, coherent light of a single wavelength. There are lasers in the ultraviolet (UV), green, red, and near-infrared (NIR) regions. When a material of polarisable bonds, for example pigment or dye, is irradiated with laser light, Raman scatterings occur (Edwards and Chalmers 2005, 18ff). The Raman signal can be separated from the incident laser light by means of holographic filters. This technique is called Raman spectroscopy. Raman instruments with lasers in the UV and NIR fields up to approximately 900 nm utilise a spectrometer called a monochromator, which contains a grid and a CCD camera as the detector. When using an infrared laser light with a

Figure 4: XRF analyses performed on site at Bortom åa Fågelsjö. Photograph by Jacob Thomas.

wavelength of 1064 nm, a Fourier Transform Interferometer is required, which amplifies the Raman signal in the spectrometer. In order to detect the Raman signal in this instrument, a special cooled detector is needed. The detected signal is recorded as a wave number spectrum. This spectrum is like a fingerprint and is specific for each substance—whether pigment or dye. The recorded spectrum can be compared with spectra from various known substances. From such a match, the pigment or dye can be identified.

Mass spectrometry is used to investigate the mass of fragments of a large molecule (Harris 2003, 518). This is done to determine which substances the molecule contains. The sample is first vaporised with high heat, using, for example, a gas chromatograph. The molecules in the sample disintegrate into charged particles called ions. The ions are accelerated in an electronic and magnetic field so that light and heavy ions are spread in different ways and then meet the electron detector at different points. Particles with the same mass and charge move to the same point on the detector and thus the substance can be characterised. This is a destructive method, which is why the analysis takes place in the final stages of the entire analysis process. Using mass spectrometry made it possible to identify egg yolk as a binder on decorations in some cases.

All the scientific methods described offer evidence of the materials and tools that have been used. For example, in our research we have found that egg mixed with oil on wooden objects is more common in the decorative folk art than was previously known (Nyström 2020b). We have also found that possibly woad was used when dying textiles, as, for example, in carpet weaving (Nyström et al. 2016). To appreciate the quality of skills in the artists' or craftspeople's ways of handling the tools and applying the materials in the composition of the motifs and patterns, one must consider the actual making process, which in its turn requires deep insights into the practical matters.

CONCLUSION

In conclusion, we can say that our theoretical perspectives are closely related to our methodological approach. The theoretical perspectives are largely based on experience and on the collective knowledge of the cross-disciplinary research group members. As several of the group members are practitioners in various crafts, such as decorative painting, conservation, and textile techniques, we are able to interpret the results from a craft scientific perspective. We understand the objects not only as artefacts created by someone but as craft materials and handicraft processes. We use our senses—vision, smell, sensation, and hearing—as a complement to the scientific analyses. We also use as many sources as possible to build as comprehensive a picture as possible of the objects and their social context, combining each group member's skills and experience in various fields in the interpretation of the results.

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ENDNOTES

1. In Swedish: *känselseende*.
2. When touching a surface or a material, different sounds can be detected.
3. The objects in focus for the research are interior paintings that have been studied in situ and individual objects such as tools, raw materials, furniture, and textiles.
4. The making of dye references was performed in 2014 by textile artist Mia Olsson and textile conservator Katarina Olars. Binder references were made by painting conservator Andreas Roxvall.

CRAFT RECONSTRUCTION

The theme Craft Reconstructions places the researcher closer to a situated understanding of the prerequisites of the artefact under study and may facilitate an embodied understanding of previous craft practices. Even in cases where craft knowledge is lost, the methodologies developed in the following two chapters may inspire researchers to look further than historical texts for answers to their research questions. The chapter “Notations on Craft: Movement, Gesture and Bodily Expression” by Harald Bentz Høgseth and Magnús Rannver Rafnsson, explores reconstruction through the craftsperson’s gestures and makes the case for developing a notation system based on the movements of the practitioner, which has the potential to both store and disseminate craft knowledge. Joakim Seiler is also describing his reconstruction processes in the chapter “Gardening Craft Reconstruction” showing how he rediscovered lost, intangible craft knowledge through his embodied knowledge which became accessible through the reconstruction of a craft situation.

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KEYWORDS: Embodied cognition, experiential knowledge, interdisciplinary research, notation systems, tacit knowledge.

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Notations on Craft: Movement, Gesture and Bodily Expression

By Harald Bentz Høgseth and Magnús Rannver Rafnsson

INTRODUCTION

There is a need to detect and to transfer craft knowledge in the field of archaeology (Stout 2002a; 2002b; Ingold 2013; Kuijpers 2018). A craftsperson carries experiential knowledge of craft processes similar to those that have left marks on archaeological sites. In cases where the craft practice has not changed dramatically over the years, there is a tradition of knowledge still living through the craftsperson's experiential and embodied knowledge. Knowledge of craft is therefore of great importance for such studies. In this chapter, the use of notations in the study of experiential knowledge in craft is discussed from the perspective of archaeology, craft sciences, and the craftsperson's practice.

Craft research in heritage studies often revolves around the reconstruction of processes and knowledge behind the creation of objects and constructions (Outram 2008; Almevik 2017; Peterson 2017). This represents a closing in, through interpretation, on the processes that are likely to have been used in the past and on the craftsperson's choice of materials, tools, and method. These must be reconstructed and studied thoroughly if a deeper understanding of the subject is to be gained. The method presented in this chapter largely follows this procedure, with the reconstruction of tools and working processes being based on the combination of observations, examinations, analysis, and interpretations.

Archaeological tool marks are the starting point of the topic under discussion—an analysis method which studies the craft and likely bodily actions behind excavated tool marks (Sands 1997; Høgseth 2007; 2012). Tool marks in timber have very distinct characteristics; they represent a craftsperson's signatures and they provide information about the tool and the way it was used. Tool marks, once identified, are analysed, and the tool, procedures, and actions behind them are reconstructed. Here, special attention is devoted to the documentation (preservation) of the information that is generated in the reconstruction process.

Attempts to develop notation systems for applications in craft research have been previously conducted by, amongst others, Willeke Wendrich, who developed an ethno-archaeological interpretation of traditional basketry manufacturing in Egypt (Wendrich 1999), defining terms and concepts for work processes through applying written studies, animated videos, and a dance notation system. Patrik Jarefjäll, in his work, adapted practice-led research and time-geography in his study on blacksmithing processes by using video recordings to analyse his own actions in a step-by-step process (Jarefjäll 2013; 2016; Eriksson et al. 2019; see also the analysis on language use in relation to bodily actions developed by Gustav Thane in this anthology). In his articles "The Semiotic Body in its Environment" (2003a) and "Pointing as Situated Practice" (2003b), the American sociologist Charles Goodwin presents approaches which he developed from theoretical and methodical grounds and which describe specific (knowledge) processes that take place and unfold through an intentional action. He analysed archaeologists' practice and their application of the body and perceptions in field situations. In addition, Goodwin studied embodied interaction, language, gestures, and body language through archaeological practice and communication in the material world (2003a; 2003b; 2011).

Many craft practices make use of notation systems that allow the practitioner to make notes about the practice for personal use as well as for sharing with colleagues or disciples. Examples can be found in the notations for sail-making, recipes for glazes in a pottery, or even mathematical calculations as notations (see also the vocabulary developed by Arja Källbom in this anthology).

Our research interest—and the focus of this chapter—revolves around developing a notation system that describes movements and gestures of a practitioner's body today, in order to interpret the anticipated movements behind tool marks from the past. The objective is to pave the way for further development of notation systems for craft research and to introduce the wide-ranging advantages that the method provides, as a complement to traditional written documentation in archaeology and to the methods available in heritage craft research presently. At the same time, the chapter contributes to the discussion in the craft research community through the reflective dialogue in traditional craft practice.

COMMUNICATION OF CRAFT SKILLS IN THE ACADEMY: KNOWLEDGE AND BODILY EXPRESSIONS

Tacit knowledge is a term that is used to describe knowledge that is difficult to transfer to others using language alone (Polanyi 1998; 2000; Ingold 2013; Dreyfus 2014; Christensen, Sutton and McIlwain 2016; Ingold 2018). Examples of tacit knowledge include the ability to play an instrument, to speak a language, or to ski. Tacit knowledge is not easily explicitly verbalised and is usually transmitted through demonstration (actions). This also applies to many situations in craft. A master demonstrates his skills and experiential knowledge mainly through bodily action—through showing how things are done—often without verbalising anything at all (Mol 1999; 2002).

Intentional actions and the practical knowledge of craftsmanship are to a large extent captured in unspoken implicit knowledge. The same is true for art forms such as music and dance. Bodily knowledge and expressions like rhythm and feelings are communicated through motions and gestures, often in a *tacit way*. The transfer of such knowledge, its communication and interpretation, take place in the interaction between people (Birgerstam 2000, 91–93; Polanyi 2000, 20–26; Goodwin 2003a, 15–24, 217–41; 2003b, 19–42; Merleau-Ponty 2003, 82–83, 121–22, 138–39; Høgseth 2007, 222–27; Clark 2008; Malafouris 2008, 401–14). This communication is, furthermore, affected by the physical surroundings we are a part of and which we shape (Heidegger 1971, 148; 1982, 163; Mol 1999, 47–89; Andersson 2001, 37–44, 136–37, 142–64; Harman 2002, 21, 34–35; Mol 2002, 1–29; Heidegger 2007, 68–72, 110–11; Høgseth 2007, 141–62; Olsen 2010, 63–88).

Craft-based practices have, to some extent, suffered from views that prioritise written sources as a means of communication of knowledge (Olsen 2010; 2015; see also Almevik and Westin in this anthology). Theorisation has gradually increased in modern education systems, affecting also vocational education (Gustafsson 2002, 28–57, 171–220; Udir 2016; Almevik 2019, 1–14). A certain lack of general holistic understanding of the many facets of knowledge has resulted in a gap between theoretical and practical training, making vocational education more and more theoretical (Gustafsson 2002, 28–57).

Craftsmanship is often defined as a skill developed in the field between practice in, and reflection upon, its practice (Adamson 2007; Knappett and Malafouris 2008; Marchand 2012; Ingold 2013; 2018). Development of craft skills takes place in the practitioner's encounters with their material environment and through experiential learning processes (Adamson 2007; Knappett and Malafouris 2008, 1–78; Marchand 2012, 260–66; Ingold 2018, 159–63). The tradition and practice-based knowledge of craftsmanship is therefore communicated both tacitly and verbally, through practice. From this arises the following questions: How can we analyse knowledge related to bodily activity more systematically? How can we better document—learn, understand, and convey—this form of knowledge?

WHY DOCUMENT CRAFT GESTURES?

Traditional craftsmanship is rapidly changing as a result of the many advances in the field, such as automation, digitalisation, and even artificial intelligence. In the context of heritage craft research, there is a reason to ask: What is the best way to document experiential and practice-based knowledge? And how can it be preserved and communicated to future generations?

Understanding the past is often important for the generation of improvements in the future. Information concerning how previous generations treated nature (i.e., raw materials and available resources through making and cultivating) can be of great value, not only to understand the past, but to learn from it. This is relevant for preservation purposes in the context of growing requirements for sustainability and even for developments of new environmentally responsive technologies. This is especially true when it comes to timber-technologies, as signs indicate that construction technologies in the past may have been more environmentally sustainable than the construction methods commonly used today.

Craftspeople, like musicians or archaeologists, have their own unique professional language—one containing various expressions, terms, and definitions to characterise the techniques, tools, and actions used (see also Thane in this anthology). As practice-based and experiential knowledge is, to a large extent, *tacit*, the most efficient way to learn is through active participation and working with the masters of the traditional craft. Apprenticeship is thus essential if the actions of craft are to be understood in full depth, including language-based dialects and specific expressions exchanged at the building site (Tempte 1982; Godal 1996; Molander 1996; Høgseth 2007).

A craft notation system based on Sutton Movement Writing (www.movementwriting.org) was applied in Harald B. Høgseth's doctoral thesis (2007) to archaeological wooden tool marks found in remnants of ancient timber structures. The method, as presented in this chapter, makes it possible to preserve and communicate knowledge that is based on bodily actions in craftsmanship. It enables a more profound and structured approach in craft research because it visualises systematically the communication of key information. The method can be used as a supplementary tool, together with other well-known methods, such as video documentation, pictures, and written documentation, or independently, such as f.ex. with hand-notation during a live performance.[1]

We thus put forward the idea that notation systems visualise depths in the craft language which written language alone is not able to offer.

In the following sections, notation systems in music and dance practice will be discussed with regard to the development of a practical notation system for craft. Thereafter, a craft-related notation system inspired by the former will be presented. Finally, the challenges and advantages of the notations in the field of craft and craft sciences will be discussed.

NOTATION SYSTEMS AS A METHOD IN CRAFT SCIENCE

Astonishingly, there are many similarities between material-based craft practice, dance, and music performance. Generally speaking, dance and music are usually categorised as art forms. This is true in education or research contexts as well. However, dancers and musicians do not perform at the highest level of their art every day; their daily practice is, to a large extent, similar to craft practice. Interestingly, the practice of both music and dancing rely significantly on communication through notation systems, which describe and communicate movements (actions) and sound respectively, through applications of standardised signs and symbols. Dance and music notations are *sign languages* that enable the communication of movements in a way other than text and spoken language are able to. Thereby, it is possible to create, preserve, analyse, and communicate—and even improvise on—specific art and knowledge by using the defined rules and framework of the system.

NOTATION SYSTEMS IN THE CONTEXT OF PERFORMING PRACTICES

Most people would agree that describing music just through words or even musical notation would be a poor illustration of the art. The tacit knowledge in music unfolds through the dynamics, rhythms, and sounds of the music itself. The way music comes alive cannot be explained by words or even musical notation alone. We gain certain insights through words, and much better and structured understandings through musical notations, but not the in-depth understanding of the procedures and nuances behind the sounds we hear and the emotions we feel. However, we do gain some insight into Mozart's musical career by analysing his compositions represented in the musical notations from the eighteenth century. However, these can never replace Mozart's tangible actions in the form of his performance, how he played, and his personal expressions such as feelings or rhythm. Nevertheless, the musical notation system preserves important aspects of Mozart's work in a structured form and enables us to come much closer to understanding the craft and the art of Mozart and his compositions than would otherwise be possible.

This can also be applied to the art of dancing. Documented choreography in the form of dance notation adds a new dimension to the practice of dancing, enabling the deeper systematic understanding and expression of so much more. Neither musical notation nor choreography can, however, reach the full depths and insights of the art form they represent and the feelings that are generated within us during a performance. It still requires hard work to become a master, but the tools to become one through systematic work and training are far more wide ranging with the notation system. At its best, the performer (the master) and the art are one; everything comes easily, without force and without thinking.

Similar arguments may be used for the art of crafts, to craft as an art form and to craft as a traditional industry, especially when it comes to the documentation, preservation, and communication of craft-related tacit knowledge. One could argue that this is of vital importance to the past and the future of craft science. How would Mozart's music sound today if it hadn't been documented and preserved systematically using a musical notation system? If such a system had not existed, we would have been dependent on a continuous and unbroken tradition, the music being transferred from one generation to another in an unbroken continuous flow. The music of Mozart would most likely have sounded very different from the original composition.

What happens to craft-related knowledge that is only transmitted verbally from one generation to the next? What is today's 'sound' of past craft? Has it changed? How will it 'sound' in the future?

Knowledge of crafts is materialised through the performer's body language, gestures, choice of procedures, force, rhythm, and other expressions of action—and the physical product that becomes the result of the actions (Olsen 2010; 2015). Although it is *tacit*, it can be reconstructed and therefore investigated through examining the practitioner's tangible actions in the present, through the physical material and traces in physical material left by them (in the past or present). This has great meaning in archaeology in the analysis of traces of tools (tool marks) in ancient wooden materials from building remains (Sands 1997; Stout 2002a; 2002b; Wendrich 2012; Ingold 2013; Olsen 2015; Kuijpers 2018).

It thus could be of great value to develop a practical craft notation system for the purpose of research and general communication of craft knowledge. Standardised notation systems could represent a common platform from which researchers and practitioners can communicate and discuss a wide range of different craft-related matters, constructively and systematically.

In the following pages, two examples of notation systems will be presented: one for performing dance practice and one for performing carpentry. The latter was inspired by the former.

THE SUTTON MOVEMENT WRITING SYSTEM

Sutton Movement Writing (SMW) is a dance notation system that was developed by the American movement notation developer, pedagogue, and former dancer Valerie Sutton (1973; 2007; 2014). Dance notation is based on a system that combines a set of five horizontal lines and a variety of standardised symbols to represent known patterns and characteristics in dance movements (see Figure 1). Sutton developed this detailed sign language to describe patterns of actions and postures in dance.

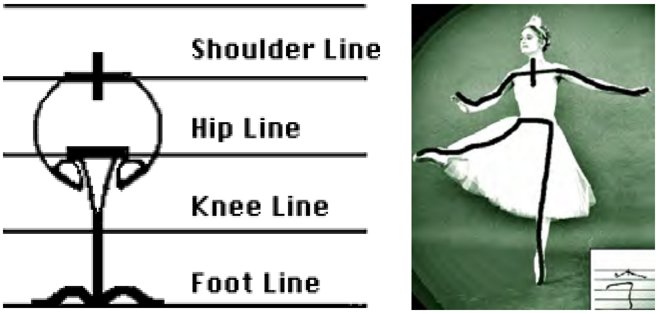
Figure 1. Sutton Movement Writing. Image reproduced from Høgseth 2007, 103.

SMW can therefore be used to preserve historical dance forms through reconstruction (transcription) of choreography and exercises.

SMW allows us to transcribe most forms of motion into characteristic symbols. This comprehensive character system was categorised by Sutton in the International Movement Writing Alphabet, IMWA (Sutton 2014). SMW not only enables us to characterise human activities, for example of a craft, but also movement patterns of animals, insects, and objects. SMW is based on a notation system developed in the sign writing community at the University of Copenhagen in 1974. Standardised symbols are designed to describe one specific characteristic motion. The system consists of five disciplines: dance writing, sign writing, mime writing, sports writing, and movement writing (Sutton 2007). The SMW system is practical, easy to learn and use, and has the ability to note even the most complex movement patterns, including levels of finger movements.

Movement writing has frequently been used to document bodily movements within physical therapy and the movement patterns of autistic children (Valerie Sutton, www.movementwriting.org). The idea emerged from the urgent need to visualise bodily spatial knowledge through a set of simple characteristic signs. The method was eventually developed further by other researchers (Høgseth 2007; Hoffmann-Dilloway 2011; 2013; 2018). In the context of craft research, the method is interesting because it enables detailed documentation of the entire body in motion and is suitable for describing gestures, rhythms, mimics, and movements.

The approach is adaptable to the performer or an observer. When being recorded from the perspective of an observer, it uses the *spectator principle*. A survey, accomplished by an observer, holds a more objective documentation and description of the performer and the context. The observer should have a basic understanding of the practice and be trained in the application of the notation system. In order to achieve qualitative results in the process, an empathetic approach is necessary to get close to the craftsperson and properly interpret and document the actions. One reason for this is that it is easier for an observer to make the notations, as the performer cannot do this while performing. At the same time, it is important to have knowledge of the relevant practice to better understand the process. However, the survey can also be conducted from the *performer's perspective*, one that is more intentional, behavioural, and subjective. The characteristic of the notation system can also be compared to the alphabet—standardised symbols that are lined up in a certain order. For that reason, the notations should not differ significantly from one observer/notator to another. However, different performers will vary in their techniques and performance-related parameters, such as rhythm, speed, and force. Still, the system as such should be just as reliable



Figures 2A–B: Dance notation, Sutton Movement Writing (SMW). Image reproduced from Høgseth 2007, 104.

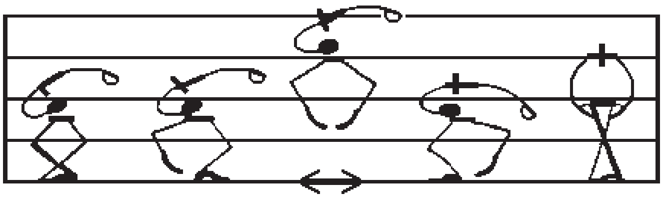


Figure 3: Dance notation, Sutton Movement Writing (SMW): punctuation, visualisation of motion. Image reproduced from Høgseth 2007, 105.

for the purpose of documentation of craft as notation systems of dance and music. A continuity and correlation between processes of actions, documentation, and analyses is required by qualitative interpretation processes.

Figures 2 and 3 show examples of SMW and demonstrate the placement of sign symbols on a five-lined staff. Each line of the staff represents a specific level of the body. The bottom line is called the *Foot Line*. It represents the ground. The next line up is the *Knee Line*, which is at knee level when the stick figure is standing straight. The next line up is the *Hip Line*, and after that, the *Shoulder Line* (Figure 2).

The figure depicted on the lines is, for example, lowered on the staff where it bends its knees or raised where it jumps into the air (Figure 3). The five-lined staff acts as a guide of level. Figures and symbols are written from left to right (or vice versa), notating movement position by position, as if frame by frame of a film. Repetitive movements can be written in a single symbol.

Additional 3D symbols, black-filled and half-filled circles, representing the third dimension, are written under the stick figures where more detail is required (Figure 4). The round circles depict the head as seen from above, providing an overhead view. The spokes projecting from the circles show the direction of the limbs in relation to the centre of the body. There are two rows of 3D symbols: one that represents the overhead view of the arms and upper body (small circles) and one representing the overhead view of the legs and lower body (larger circles).

SMW dance notation can also be presented in time and in the context of music and musical notation, combining time (music) and three-dimensional spatial movement (dance). Two sets of five-string layouts are then required: one for the musical notation and one for the dance notation. This is well known from classical dance notation (Figure 5).

Dance writing shorthand (Figure 6) enables a trained writer to write movement at the speed it occurs. This, like secretarial shorthand, is a shortened

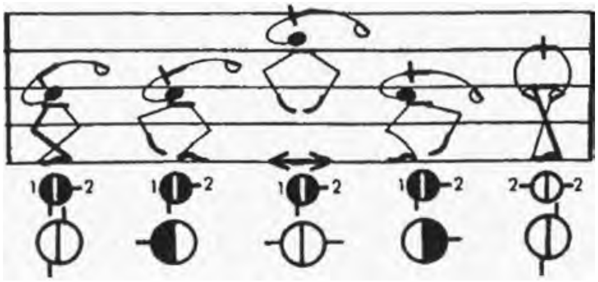


Figure 4: Dance notation, Sutton Movement Writing (SMW): two rows of 3D symbols below the staff. Image reproduced from Høgseth 2007, 105.

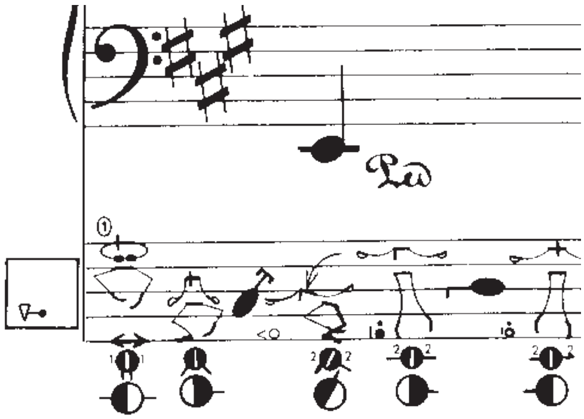
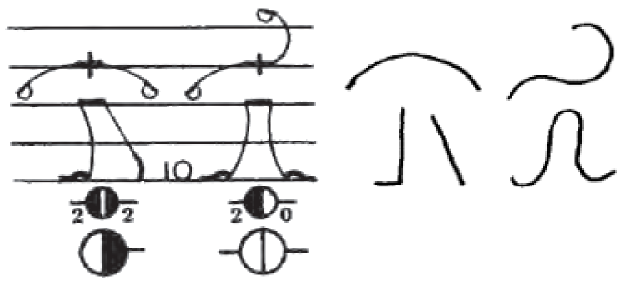


Figure 5: Dance notation, Sutton Movement Writing (SMW): classical dance notation combined with musical notation. Image reproduced from Høgseth 2007, 105.

version of the stick figure. An entire dance performance can be captured in 'first-draft' form using the shorthand, later being transcribed into detailed Dance Writing. Hundreds of dance students at the Dance Department of Boston Conservatory of Music in the late 1970s learned the shorthand with success (Valerie Sutton, https://www.dancewriting.org). This carries great potential for applications in the field of craft sciences.

This system of dance notation enables the characterisation of the speed, strength, interaction, and connection of the movement, containing hundreds of symbols that are logically built up. Movement writing is applied as a method in Høgseth's study, in which he analyses the embodied and characteristic motion patterns of craftspeople that come alive during the processing of timber (Høgseth 2007). The characteristic working techniques and procedures behind the output (the physical piece that becomes the result of the process) can be systematically examined in great detail, through signs and symbols, in a step-by-step transcription of a craftsperson's movement during action. While the method may be applied in several different craft disciplines, we here focus on carpentry and processing of timber.

From the perspectives of archaeology and craft science, the above method can be applied in reconstructing processes from the past, in which traces of tools (tool marks) upon wooden artefacts are the starting point. SMW, because of its simplicity, flexibility, and convenience, seems to be very adaptable to practice-led research in the field of craft sciences and the analysis and characterisation of a craftsperson's actions.



Figurse 6: Dance notation, Sutton Movement Writing (SMW): detailed dance writing (left) and dance writing shorthand (right). Image reproduced from Høgseth 2007, 105.

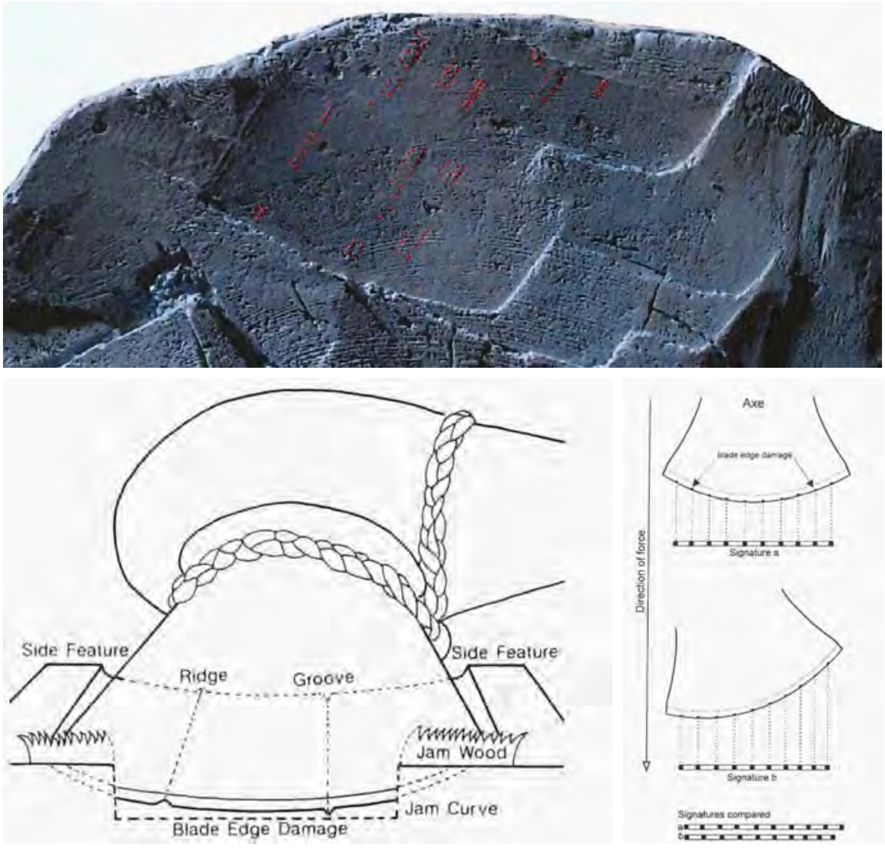
APPEARANCE AND RECONSTRUCTION OF TOOL MARKS IN ARCHAEOLOGICAL MATERIAL

Tool marks, once found on the surface of ancient timber, may be analysed using different types of research methods. Examples include silicone casting and 3D photo scanning. Such methods allow the tools, techniques, and procedures behind distinctive characteristics of the deformed wood surface (tool mark) to be reconstructed (Figures 7 and 8).Through analysis of tool marks, it is possible to identify specific tools and even the individual characteristics of tool marks made by specific craftspersons, and thereby link processed timber to a single tool used by a specific person. Factors such as the centre-distance between stroke series, depth, geometry, and the angle of the marks all reveal valuable information about the rhythm, force, and dynamics that must have been applied in the process

The method reveals details of the characteristics of a specific tool, such as the shape and geometry of the tool's edge and other impressions rooted in damage and wear of the edge. From this, we can even establish whether the chopping was done by the same craftsperson or tool. This makes it possible to systematically map the identified characteristics, for example the axe's gradation and the depth and order of the tool marks on the surface of the timber. Tool marks can also be used to identify separated timber constructions. It may also reveal the craftsperson's posture and standpoint towards the timber (Figure 8). This information supplemented with other methods, such as dendrochronology, can, piece by piece, yield a coherent picture of events in the past.

The picture in Figure 7 and the sketch in Figure 8 show the relationship between signatures and the 'stopping mark' of the axe (i.e., where the edge of the axe stops). The stopping mark uncovers the curvature of the edge. The angle between the signature and the stopping mark uncovers the circulating movement of the axe, and thereby the posture of the craftsperson during the working process. If the angle between the stopping point and the signature changes, this represents a change in the craftsperson's posture and standpoint towards the timber.

In other words, studies of archaeological tool marks reveal important information on the relationship between the craftsperson, the material, and the processes involved when the timber was processed.

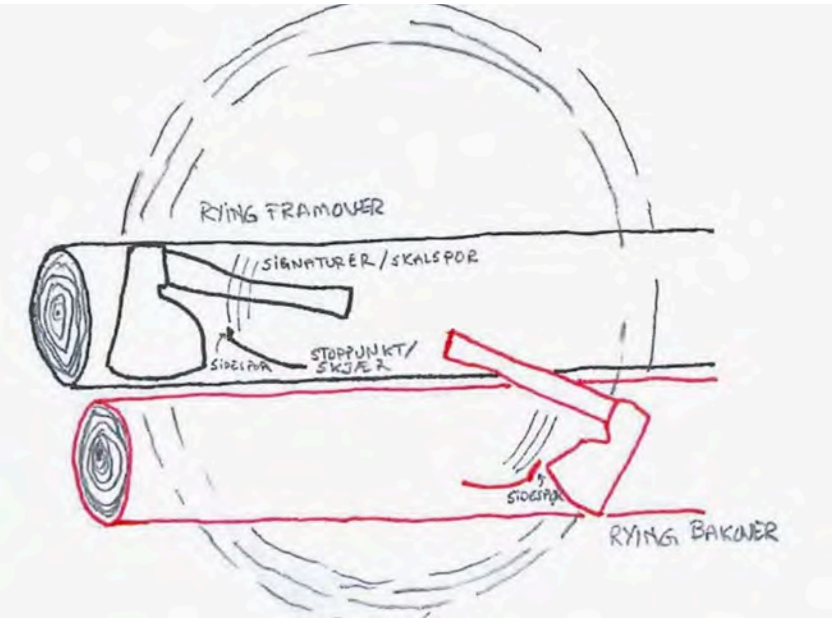


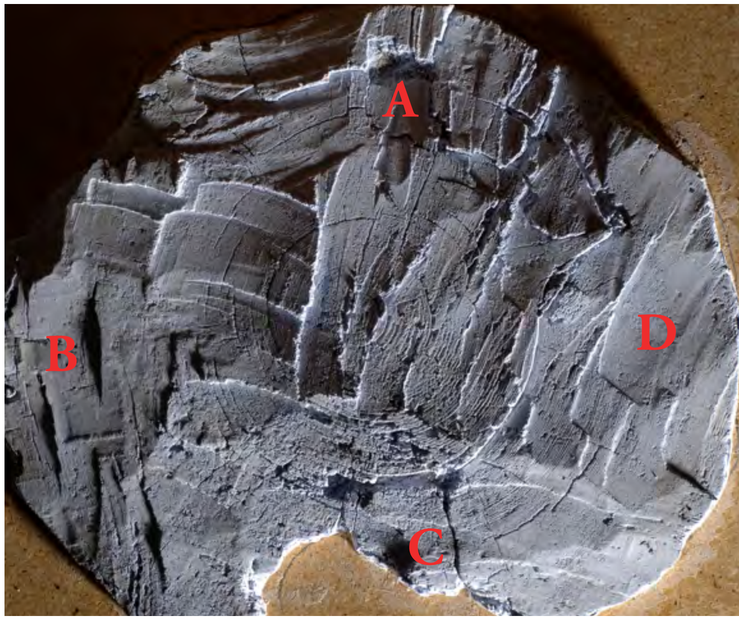
Figures 7A–C: To the left we can see the ridges and grooves from the same axe with its characteristic signatures (Høgseth 2007). To the right and in the middle, tool marks with distinctive individualities are evident (Sands 1997).

Further, Figure 9 illustrates the procedure of log-cutting, which can be recognised through the characteristic tool marks clearly visible on the photograph. The shape of the tool marks indicates that the procedure must have taken place in four cutting steps (A, B, C and D), where the log is turned and cut from four different sides.

The cutting process seen in Figure 9 can be characterised as follows: the craftsperson started the chopping process in area A, then turned the log and continued in area B, after that turning it again and moving to area C and finally D. Throughout the process the log was turned to the right, with the carpenter chopping from the outer surface inwards towards the marrow. The log's D area faced upwards after the chopping process was completed. The carpenter completes the cutting process by brushing off the goat wood from the outer edge and moving gradually, with long strokes, inwards towards the marrow. He uses long, controlled, steady movements. The purpose of the brushing is to remove irregularities and the fracture from felling the timber in the woodland.

Area A shows that the craftsperson took up a position on the right side of the log. In area B, however, the carpenter seems to have continued chop-





Figures 8-9: (Left) The axe follows a curved path and rotates when used (Prytz 2005). (Right) Casting of tool marks (log 1077) from the Nidaros Cathedral excavation (Høgseth 2007).

ping on the opposite side. The stopping mark of the axe's blade supports this hypothesis, the angle being steeper towards the side features on the right side. In other words, he must have been standing on the left side during the cutting process, the log then being turned and hewing continuing in area C. Here also the carpenter must have cut the timber from the right side of the log. He then stopped in area D. These cutting series very clearly visualise the method and procedure applied in the process of cutting the log. The craftsperson moves gradually from the outer surface of the log, inwards towards the centre. He works from the left side of the log, with cutting being conducted from four sides/edges, whereby he regularly shifts between the left to right side.

This detailed analysis enables us to reconstruct the production process behind a tool mark very accurately. When the correct movement patterns and bodily actions have been identified, they can be registered (transcribed) in great detail in the craft notation system. In the context of heritage studies in craft, the analysis therefore serves as the generator of the input data for the documentation and future preservation of the relevant craft knowledge.

THE PROCESS OF WRITING CRAFT: RECONSTRUCTION OF WORKING PROCESSES WITH THE HELP OF NOTATIONS

In this section**,** the process of writing craft procedures into a craft notation system, developed on the basis of Sutton Movement Writing, will be presented. This is a process that comes into play mainly when analysis of tool marks and the reconstruction of tools and procedures have been completed. The tool marks are the starting point.

In the reconstruction process, snapshots are taken from video recordings and used as key patterns in the documentation of the relevant actions. This is a transcription process not unlike analysis of jazz music performances, especially when it comes to improvisations. Selected snapshots that represent visual key information of a bodily action are then transcribed piece by piece, using signs and symbols developed from the SMW notation system.

In Høgseth's study (2007), reconstructed working processes were documented by video recordings from two different angles. A fixed camera recorded the posture of the craftsperson and the process from the side. A mobile camera was used to visualise the posture and the process from the front and from behind. The cameras were used to analyse action details—i.e., techniques, gestures, rhythm, procedures, etc.—where the aim was to examine the artisan's actions in the reconstruction process. It is important to gain insights into what happens before, during, and after each action, and the context of embodied processes when the tool marks and the reconstructed procedures of cutting become alike. This approach in craft research is aligned with methods of practice-led research, where the researcher's position is that of the participating performer and the participating observer.

The video recordings were carefully studied and documented with help and inspiration from the SMW notation system. It enabled detailed description of postures, movements, and processes around the cutting procedures. Six main action patterns were identified:

• The movement of the upper body in relation to the axe's rotation

• Leg posture and movement in relationship to the axe's rotation

• Combination of leg posture and upper body in relation to the timber

• Combination of leg posture and upper body in relation to material and tool

• The dynamic of the movement, timing, and rhythm

• Direction of sight (eye contact)

The working process, represented by the craftsperson's position, posture, movements, and the relationship between position, posture, tool and the material, is of major importance. It is important to identify the start and end position of the axe during the cutting movement. This allows the context of body movements and the techniques that are applied in the creation of tool marks to be better understood. Thereby, one must consider where the centre of gravity of the axe and body lies during the rotation and fluctuation of the axe (see Figure 10).

The study and documentation of the upper body movement in relation to the axe's rotation raises many questions, such as: How should upper body movements be described? What signs could be used to describe the movements of the shoulders, their posture and position? Their geometrical relationship? Is the posture vertical, horizontal, or inclined? Which shoulder is higher, which is lower, how do they rotate and how does their location change through the movement? What is the position of the head? What is the direction and focus of the eyes? What about the direction of the face, as shown by the face and nose? And what of the level of concentration and focus during the work? These are questions one needs to ask in the process of documentation of key information (see Figures 11–14).

In order to approach useful answers to all these questions, the researcher (the spectator) needs to systematically study a variety of different parameters related to the bodily action that is being analy-

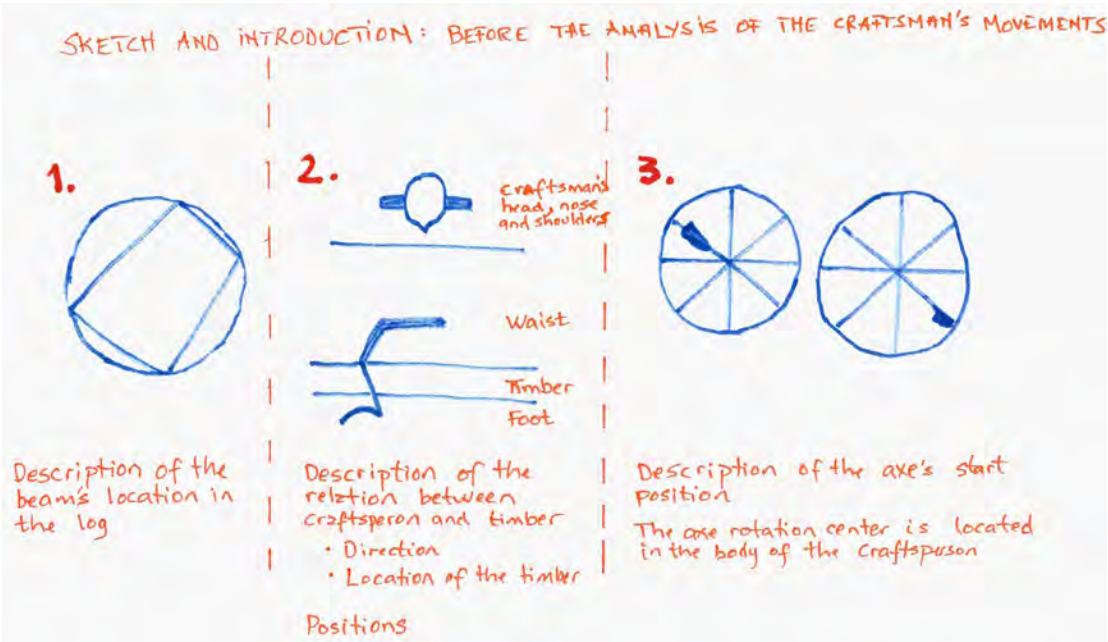


Figure 10: Sketches from the working process: 1. Cross-sectional form of log; 2. Description of craftsperson position and posture in relation to the tool and the material; 3. Start and end position of the axe during rotation (centre of gravity in the craftsperson's body).

sed by asking specific questions. The notation system serves here as an excellent analytical tool that is also capable of visually preserving key elements of the answers and putting them in context.

And it is not enough to limit questions to parameters of body posture, head, or shoulders. The craftsperson's grip on the tool—the axe—is of great importance as well. Twisting and rotation of the body and tool need to be described independently, in relation to one another and with regard to changes during the time period the relevant bodily action takes place. This is not an easy task, especially with methods that are limited to written and oral documentation forms. Standardisation would generate substantial benefits for any type of analysis with craft notation systems.

In Harald B. Høgseth's doctoral thesis (Høgseth 2007), video recordings of bodily action processes were analysed in parallel to text and pictures that were taken during the process. The video analysis and the sign writing method explains what happens in a way that the written language alone cannot. The sign writing, video analysis, and written descriptions together thus make it possible to generate a greater value than is otherwise possible with written documentation alone, with very profound understanding and a more thorough description of the know-how involved in the process.

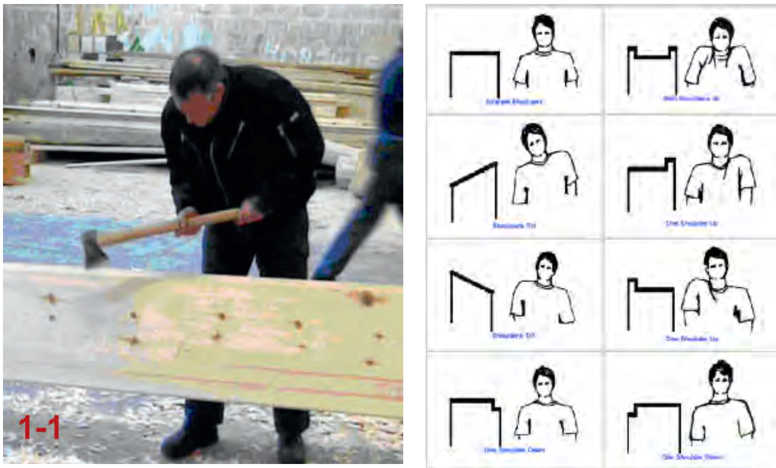


Figure 11A–B: Example showing shoulder line highlighted. Photograph by Atle Ove Martinussen, NHI; drawings to the right by Valerie Sutton, http://www.movementwriting.org/science/craftsman/.

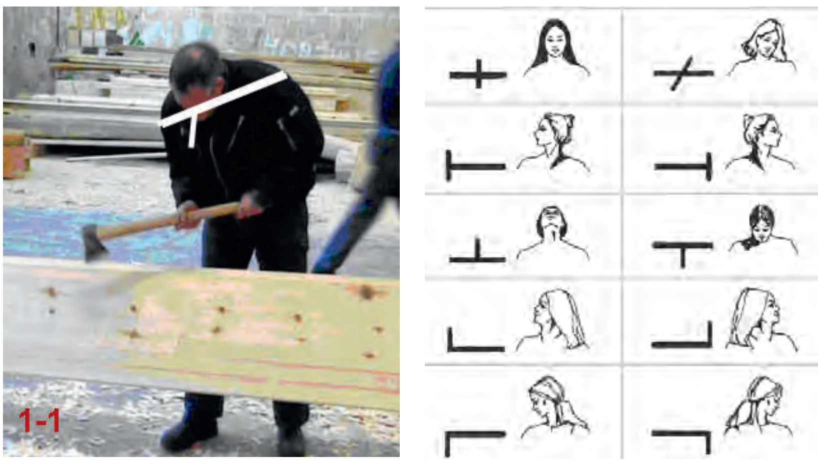


Figure 12-13: Symbol shows how shoulders are tilted forward. Photograph by Atle Ove Martinussen, NHI). Figure 13 to the right, symbols showing head positions. Drawing by Valerie Sutton, http://www.movementwriting.org/science/craftsman/).craftsman/.

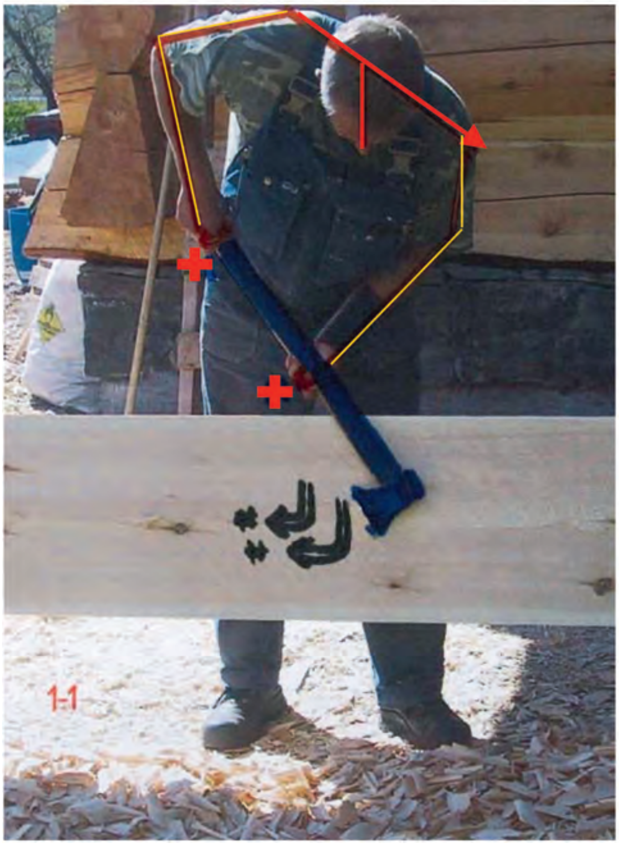


Figure 14: The thick red sloping line marks the position of the shoulders and the position of the hands is marked by plus signs. The position of the arms in relation to the shoulders and the position of the head in relation to the position of the hands can therefore be shown. Signs can be used to indicate the way in which the tool is gripped. Movement symbols mark how the tool stops, the movement precisely placing the tool on the timber. Photograph by Atle Ove Martinussen, NHI (1980).

DEVELOPING METHODS IN CRAFT RESEARCH THROUGH NOTATIONS

The concept of writing crafts and the junction between the documentation, demonstration, bodily action, practice, and analysis of craft presents many challenges. The starting point of the study of craft in archaeology is often hidden in the surface of timber remains, the remnants of the craftsperson's working-techniques, procedures and methods being conserved in traces of tools (tool marks) found in physical constructions and objects.

Tool marks have very distinct characteristics and represent a craftsperson's fingerprint. Such signatures provide us with information on the connection between the artisan, their materials, their working rhythm and the processes behind various building parts (Sands 1997; Høgseth 2007).

The analysis of crafts from the past is rooted in several scientific problems: the tacit and physical context, the relation between past and present, and the relation between theory and practice being just a few examples. Sands (1997) and Høgseth (2007) have each given substance to the assumption that it is possible to transmit craft knowledge from an intangible context in the past, when craft knowledge was alive, to the present, through analysis of tool marks found in archaeological timber (Høgseth 2012).

However, complementary methods that capture craft knowledge in its entirety are needed for the analysis of the traditional craftsperson's practice—methods that provide a more profound understanding of the subject than what can be written in documentation alone (Olsen 2010; 2015). Otherwise, the risk of losing important aspects of the knowledge is greater (Høgseth 2007, 220–64). Written documentation, supplemented by video recordings and craft notation systems, allows crafts scientists to analyse in greater depth the processes and complexity behind apparently simple actions. No writing, notation, choreography, or any other sign system can alone cover all aspects of the knowledge. However, together they can provide a more complete picture of the whole.

Craft, unlike dance and music, leaves something concrete and physical behind. This could be a small object, a building, a structural system or a beam—the traces of sequences, workflow procedures, techniques, or even material selection being the key to unlocking the knowledge behind it. All traces and tool marks are a form of the expression of the craftsperson's know-how. The performance of music or dance is the intangible result, which we experience and memorise through hearing and visualising the act in our mind. It is the abstractions and the actions which remain in our memory after the music or dance has stopped (Høgseth 2013). There is no physical result, such as a piece of wood, a building, or some other physical product. Not even a tool mark. The physical outcome of craft, such as an aesthetically appealing object or a cleverly designed piece of wooden furniture, well-known in design and architecture, can, however, also be experienced and memorised through visualisation in our minds, thereby potentially generating similar effects on us.

Notation systems and transcriptions play an important role in music and dance in achieving a deeper and broader understanding of the art and the master behind it. The same could be argued in craftsmanship. One of the experiences which young jazz musicians need to undergo in their education is to transcribe jazz improvisations from older masters. It requires an ability to listen, repeat, imitate, and to notate while practicing. It certainly takes a lot of practicing if the master's skills are to be fully understood. This approach to the thorough reconstruction and preservation of music would not have been possible without musical notation systems. The overflow of digital tools has accelerated the process, but the musical notation system is still today in the centre of the process.

Tool marks are key elements when it comes to craft research in archaeology because they enable transcriptions of craft performances from the past. They are the link between the past and the present, the starting point that enables us to reconstruct craft knowledge. Application of craft notation systems as a method, combined with other well-known survey and documentation forms, yields the possibility to approach craft research, the arts, and industry in a new analytical and communicative way.

Craft plays an important role in our society, and through this has great diversity in art, industry, and our daily life. It seems logical to develop a craft notation system that could represent a similar practical functionality, like that of music and dance.

THE OPPORTUNITIES AND CHALLENGES OF DOCUMENTING CRAFT WITH A NOTATION SYSTEM

Languages and communication play a central role in understanding humans and their surroundings. In semantic and language research, there is occasionally discussion of languages and communication (Hansen 2005; Raanes 2012; Raanes and Slettebakk 2017). In traditional linguistics it is common to emphasise language systems and the mathematical and grammatical elements related to languages. Others study humans as a whole, concentrating on the relationship between the bodily, physical, and linguistic work in human practice and what this, in its entirety, communicates (Goodwin 2003a; 2003b; 2011; Hoffmann-Dilloway 2011; 2018). The focus is then on the communication itself, and not the grammatical system, in order to better understand what is being communicated. This is of special importance when knowledge processes related to practice are to be analysed and understood in their entirety. Intentional action cannot be isolated to studies of the physical practice alone, but must include the perceptual human being as a performer in his or her surroundings.

Why should we bother to describe past practices? Why is it important in craft research to characterise bodily motions of craft practice using notation systems? One reason is the importance of understanding the different layers and dimensions of knowledge. Another is to preserve traditions and heritage by supporting transmission of knowledge and skills between generations. Yet another is the communication of that knowledge to specialists in crafts, to scientists and students. To learn from the past for improving the future becomes easier, if the knowledge can be easily accessed. Craft notation systems could serve as a platform for the communication of traditional crafts, as they are powerful tools for applications in analysis and reflective dialogues about craft and practice and seem to enable a greater sensibility than some other methods.

In American jazz music, musical notation often isn't needed at all, especially among professional musicians who have developed a large musical vocabulary and have learned many jazz standards (jazz songs). However, the musical notation platform serves in the background, preserves the song (documentation), and can be looked up at any time. Thereby, it is a way to communicate music (from past and present) and preserve future generations' learning of the art. The same is true for industrial music such as pop music, but is not necessarily true for all music traditions in the world. Music can be communicated without a musical notation system, but not preserved in the same way nor would the communication be possible at the same level of complexity.

The Western music tradition has served as a strong foundation for development of new music and new musicians who have to learn the craft of musicianship. It used to be something only few people had access to, but is today widely distributed all over the world. Far less is known about music before the musical notation system was invented. It is, however, important to emphasise that a musical score doesn't tell the whole story of a musical piece, how it should be played, or what it was intended to communicate, but it provides the key information needed to develop the skill that is required to perform. It is therefore important to make the knowledge form understandable and capable of being communicated, without the performer being present. The physical instruments and the mental music practice can both disappear when the performer and the tradition disappear. Notation systems are therefore important tools for maintaining and developing knowledge and traditions.

The development of a craft notation system needs to be considered as a challenging task, even if it is limited to research purposes only. There are signs, symbols, and systems from other disciplines already known that could serve as a base for the beginning, as discussed previously in this chapter, but a developed system needs to be more easily accessible and user-friendly if it is to generate value for the user.

Is there a need for a notation system for craft? An audio-visual recording visualises much of what written language is unable to communicate (see Groth in this anthology). Video documentation as a method for documenting actions of craft is alone, however, not sufficient; the pictures/scenes pass quickly and one must constantly rewind and even stop the video to study the details. Pictures, on the other hand, communicate static scenes that can be studied in great detail, picture by picture. However, as they do not convey the movements and actions, they are also not sufficient if the complexity of a bodily action in its entirety is to be grasped.

There are grounds for believing that the documentation and research of craft in archaeology yields the best results by combining different forms of approaches. A craft notation system has the ability to highlight the details of what happens in action-based knowledge in a very profound way and offers an alternative for the documentation of craft with great potential in several craft contexts. Combining a variety of methods yields better results.

CONCLUSIONS

In this chapter, notations in craft practice have been introduced as a means of documenting, preserving, and communicating craft knowledge. This includes aspects of practice that may not be conveyed using verbal language only. Standardised notation systems from other practices such as music and dance have been discussed in the context of developing a practical method for craft notations to demonstrate what could be achieved by such a system. The objective, as stated earlier, is to pave the way for further development of notation systems as an alternative tool in craft research.

A number of questions have been discussed, such as why we should document craft gestures, how knowledge related to bodily activity can be analysed more systematically, and how this form of tacit knowledge can be better preserved and conveyed. It has been shown that the documentation of tacit craft knowledge is possible with the help of a craft notation system and that it could yield significant benefits for craft research, documentation, and preservation purposes, especially in archaeology of wooden structures. A well-developed craft notation system, as an alternative tool in craft research, has profound potential for deep systematic analysis of craftsmanship.

In the context of craft research on historical timber structures, tool marks found in building remains represent an important starting point for craft notations. Such marks are a result of a craftsperson's actions imprinted in the timber surface. Translating such signs into an academic format requires the development of a spatial three-dimensional understanding of the bodily actions and movement patterns of craftspeople—in space and time—as the timber constructions were produced. Thereby, as previously demonstrated, a reconstruction of the process is necessary in order to be able to document the craftsperson's bodily activity systematically in the form of craft notations.

Further development of a practical craft notation system is needed if it is to be applied efficiently as an alternative tool in craft research. As pointed out previously, notation systems do exist both in dance and music. They are widely used and have been proven to be very practical. Dance and music notation systems are flexible communication platforms for dance and music and for their respective industries, for research, art history, and musicology. The dance and music notation systems are very efficient tools for describing movements and sounds in a systematic way, with consideration of both space and time. This chapter has stated that a similar communication platform could be developed for studies of bodily action related to craftmanship and that similar levels of sophistication and practicality could be achieved with further developments of craft notation systems.

It was also presented how craft researchers have started to develop such systems for the communication of knowledge on craftsmanship. As a supplementary research tool, craft notation systems have the potential to add a new dimension to traditional craft research methodologies. A fully developed bodily action notation system for craftsmanship has the potential to promote deeper understanding and to systematically preserve knowledge in the field. Furthermore, such a system may make craft more accessible to researchers and students and could thus be used for pedagogical purposes. It also has potential for conservation purposes, in building restoration, and for museum visitors and craft enthusiasts in general. In the process of research, documentation, and communication of the knowledge of craft, such notation systems should therefore be studied and applied in combination with the spoken and written language.

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ENDNOTE

1. A freehand sign writing (notation) by an observation of a performing craftsperson.

Joakim Seiler is a master gardener and practitioner researcher with a PhD in Conservation. Joakim has been Head Gardener since 2004 at the eighteenthcentury estate of Gunnebo House, Sweden. He has been working all his adult life with historic gardens and he has specialised in traditional gardening craft.

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Gardening Craft Reconstruction

By Joakim Seiler

INTRODUCTION

This text presents processual reconstruction within craft research as a method to gain knowledge in, and about, historical gardening relating to lawns and hedges. The chapter is part of my research into eighteenth-century horticulture and the question at hand is *how can reconstruction of craft be used as a method to advance our knowledge about history?*

Processual reconstruction is a recognised method of inquiry and education in the Nordic countries as well as in some other research environments (Almevik 2011; Smith 2016; ARTECHNE 2020). By processual reconstruction I refer to a reconstruction that is developed step by step in a process of actions and where one step provides clues for the following (Almevik 2011, 161). It was first used within building conservation and reconstruction in Norway in the early 1990s by Anders Haslestad, among others, and was further developed by Gunnar Almevik and Peter Sjömar at the Dacapo Vocational College of Crafts in Mariestad in Sweden as an educational and research method in the 1990s and beyond (Högseth 2007; Björvik 2009; Almevik 2017, 8; Sjömar 2017, 117, 150–51). Craft education expanded into craft research and a number of craftspeople started to do research. One of them, Tina Westerlund, investigated gardening craft in her research (Westerlund 2017). A number of the craft researchers worked with processual reconstruction as one of their research methods (Karlsson 2013; Jarefjäll 2016).

With this chapter I bring the method of processual reconstruction into the garden context. The aim is both to investigate the functionality of the method in this craft area and to contribute to the field of craft research through methodological development.

The boundary of gardening and processual reconstructions is not obvious. Gardening is often *repetitive* (not in the meaning of *boring*, but in terms of being *characterised by repetition*). Reconstructions are also to repeat something, especially when it comes to processual reconstructions, where activities can be repeated over and over again, and in this sense, reconstruction is related to the concept of tradition (Leijonhufvud in this anthology). Tradition is the repetition of unbroken practice; reconstruction is repetition of broken practical tradition (Planke 2001).

When a craftsperson representing a living tradition is discovered, he or she can teach a new generation of craftspeople. However, dealing with the eighteenth century, some significant craft practices have vanished. Practices that used to be performed in gardens in Sweden have disappeared and can hardly be found here anymore; in some cases, they still live on in rural Romania (the craft of using the scythe) and in other cases as a landscape practice in the UK (the knowledge of using billhooks) (Reif et al. 2008; Hedgelaying, n.d.). In such cases, there must be a thorough international research for historical practices, or the craft has to be reconstructed. The present research has not allowed for an international search for tradition bearers—that is, for searching for living practices abroad and learning from them. Rather, this text will focus on the reconstructed practice.

The experiments have been executed at Gunnebo House, an eighteenth-century estate outside Gothenburg in Western Sweden where I am Head Gardener. I am both Head Gardener since 2004 and a researcher since 2015 and use the gardens of Gunnebo as a laboratory for the investigation of historical gardening. I do not hold the title of Researcher at Gunnebo.

Gunnebo House is a listed building and garden, a cultural reserve, and an official cultural heritage. It was originally designed by architect Carl Wilhelm Carlberg and built in the late eighteenth century as a summer house for a wealthy merchant in Gothenburg. In 1949 Gunnebo was bought by the municipality of Mölndal and the estate changed from private to public. With that shift of ownership an intense process of restoration and reconstruction started that took place during the 1950s in the Villa and in the pleasure garden. During the 70s and 80s there was a focus on maintenance. In 1995 a new period of development with restoration and reconstruction began. In this period there was a focus on *process* in the reconstruction projects (Seiler 2018, 9). There has been great interest in the original construction circumstances. In other words, the following question has been asked: *How did they build this house or garden in the eighteenth century?* To investigate this question, traditional craft has been instrumental and working with traditional tools and working methods has resulted in the spread and reconstruction of craft knowledge and skill at the estate. Both employees and students participate in this knowledge consolidation and production.

In order to improve garden conservation and knowledge about historic gardens, it is important to know the eighteenth-century management methods. When these methods are known, they can be compared with contemporary methods and the differences in result can be assessed. The methodology of my research is practice-led in the sense that my research is being carried out through practice (Smith 2016, 217; Groth 2017, 31; ARTECHNE 2020). One of the practice-led research questions has been: *How was this work done in the eighteenth century in Sweden?* To investigate the question, I have turned to historical text and image sources. These have provided me with information about eighteenth-century practice that has first been

Figure 1: The northern pleasure garden at Gunnebo House which was part of the laboratory for the reconstructive experiments in this study. Photograph by Joakim Seiler 2017.

observed, then interpreted and generalised into a hypothesis about historical practice. This hypothesis has then been tested in experiments in the garden. The experiments have provided me with validation, discoveries, and affordances that have developed the knowledge on how these works were performed in the eighteenth century. The results from the experiments inform the historical sources and improve my understanding of them. The methodology should not be comprehended as a step-by-step process but instead as a circle, where the stages of knowledge production are developed iteratively and in dialogue with each other. The research is conducted from a subjective position with the craftsperson—me—as the researcher and it is a historical study within craft research.

From this introduction follows an explanation of the methodological approach used for my craft reconstruction. Three cases of processual reconstruction are then presented: the reconstruction of eighteenth-century lawn management, the construction of a seventeenth-century lawn, and the reconstruction of eighteenth-century hedge management.

METHODOLOGICAL APPROACH

Reconstructions in a Craft Context

In this specific study it is not primarily the garden element (e.g., the lawn, hedges, flower beds, trees), the tools, or the historical text and image sources that are investigated. They are important elements in interplay with me, the practitioner. In fact, the practitioner with his/her skills, experience, and making is at the very centre of the research. This is the *dwelling perspective*, a concept introduced by Tim Ingold and a different position than found in most scientific disciplines, where an outside position as an objective observer is the aim. The dwelling perspective allows the study of practice and skill from an inside position. It "demands a perspective which situates the practitioner, right from the start, in the context of an active engagement with the constituents of his or her surroundings" (Ingold 2000, 5). The dwelling perspective is my position in the research presented in this chapter.

Reconstruction cannot only be a means to an end when an object is reconstructed; it can also be a method for development of knowledge. In processual reconstruction, three elements are of certain interest for the result: *the interpretation of the craft procedure*, *the experience and skill of the craftsperson*, and *the surrounding circumstances* (Högseth 2007; Almevik 2011, 165). These elements need to be scrutinised with source criticism.

Skill is vital within craft practice. It is not only mechanical gestures remembered by the body and performed without thinking (Ingold 2018, 159); it is a form of knowledge that resides in both body and mind. Neither is skill only repetitive; it is also creative. Tim Ingold emphasises the investigative qualities of skill that are used to explore the unknown and thereby develop new knowledge and insights (Ingold 2018, 161). This quality makes skill different from habit. Furthermore, Ingold states that: "Skill is about going along with things—about responding to things and being responded to. In a word, it is a practice of correspondence" (ibid., 162).

Pamela H. Smith is a historian specializing in early modern Europe (1350–1700) with focus on craft knowledge and the role of craftspeople in the Scientific Revolution. Smith founded *The Making and Knowing Project* at Columbia University. In the project, reconstruction was used as a method to decipher and understand an anonymous manuscript with all kinds of recipes from the sixteenth century (Smith 2016). Smith describes reconstruction as method within the project in the following way: "Reconstruction of the recipes in the manuscript [...] could help to understand the materials and techniques in this manuscript, so difficult to draw out by reading alone" (ibid., 215). Furthermore, she explains that reference objects from museums were studied as a first stage in the reconstruction process as in most archaeological research (ibid., 217). Then she stresses:

> Where he [the anonymous author-practitioner] in a laborious process of translating his making and doing into words and writing, we reverse engineered his words into processes and products. This reverse engineering necessitated conventional textual research, object-based research, and the hands-on research of reconstruction. (ibid., 217)

This description is similar to my experience of gardening reconstruction as a time-gap-apprentice (Kelly-Buccellati 2012, 204), described in the following. Smith continues by stating that: "The recipes in the manuscript necessitate imitation and re-enactment in order to be comprehensible. Indeed, it became clear to us that 'reading' the text for understanding in fact meant reconstructing the actions described in it" (ibid., 218). One discovery in *The Making and Knowing Project* was that historians significantly benefit from gaining the literacy of craftspeople through hands-on working in order to understand materials and techniques (ibid., 219). The project also investigated how reconstructions could be used as historical sources in a responsible way. The reconstructions of the recipes in the manuscript provided several discoveries, such as, for example, "the author-practitioner's system of knowledge about nature and the behavior of natural materials" (ibid., 221). The reconstruction experiments in the *Making and Knowing* laboratory provided bodily and sensory insights into the manuscript.

A different contemporary example of innovative historical research is the ARTECHNE project on "Technique in the Arts: Concepts, Practices, Expertise, 1500–1950." The project is directed by historian Sven Dupré at Utrecht University and the University of Amsterdam. The aim of the project is to explore how artists master their art and how technique or skill is transferred from one artist to another. This is investigated with a transdisciplinary approach combining methods of research from humanities and natural sciences. How-to instructions in historical recipes are explored through the reconstruction of historical recipes (ARTECHNE 2020).

So, both *The Making and Knowing Project* and the ARTECHNE project explore reconstruction as a method to develop historical knowledge connected to art, craft, and making. Furthermore, in both projects, recipes are central. In my research, the historical garden manuals are explored in a similar way and the gardening descriptions are treated as recipes for gardening practice.

Another example of processual reconstruction is found in the carpenter Tomas Karlsson's (2013) investigation of traditional carpentry when he reconstructed a wooden handmade door. In his licentiate essay, he built on reference objects, like existing doors, and developed a dialogue with a historical carpenter. This methodology consisted of a dialogue between Karlsson as a carpenter and the writing of a historical carpenter. Both Karlsson's experience as a carpenter and his performance of the actual procedures in making a door were important in the process. The same approach was also applied by Katja Grillner, Professor of Critical Studies in Architecture at KTH (the Royal Institute of Technology) in her thesis (2000). Her work was a meeting and fictional dialogue between herself today and historical persons in a historical garden. The meetings in the thesis take place in 1770, 1777, and 1999, "all times present at once" (Grillner 2000, 2). These examples show traditions that have changed, a process which is partly due to industrialisation. Karlsson and Grillner also point out gaps in history, traditions, and methods. Addressing these gaps and methods is highly relevant for my investigation.

A somewhat similar methodology is described in the work of the archaeologist Marilyn Kelly-Buccellati with the concept of *time-gap-apprenticeship* (2012, 204). Kelly-Buccellati describes time-gap-apprenticeship as a recapture of skills from the past that have been forgotten; however, they can be reconstructed with the help of the knowledge within a tradition that is still alive (see also the respective chapters by Högseth and Botwid in this anthology). Craft knowledge and aesthetic ideals can be transferred in this way. However, cultural and social values and customs are not likely to have moved on unchanged over time. Nevertheless, the appreciation of an old craft tradition shows that the revival is not solely technical but also has to do with notions of value (Kelly-Buccellati 2012, 221).

This methodological approach of time-gap-apprentice, or *dialogue through time* as a reconstruction, has been taken on by me in dialogical work with three gardeners: André Mollet, a royal gardener from the seventeenth century; a Swedish gardener, Peter Lundberg, and his written garden manual dated to 1754; and a Scottish gardener, John Abercrombie, from the late eighteenth century.

In the processual reconstruction, the eighteenth-century text and image sources, the horticultural tools, and the practitioner all interact in the development of knowledge. However, additionally, the garden element in itself reacts to the practice applied and it could be described as if the physical surroundings provide affordances to the practitioner. The psychologist James Gibson introduced ecological psychology and the concept *affordances of the environment*, which can be defined as what the environment offers as possibilities and restrictions to the human being or animals (Gibson 1979). The environment is full of meaning on its own and does not have to be ascribed with significance from an observer; its significance can instead be discovered by perception (Gibson 1979). The surroundings provide affordances to humans and animals but the affordance is also dependent on the specific human being or animal. For instance, a small tree can provide the affordance for climbing to a cat or a child but not to a heavy adult human. Although it is the same tree, the affordance differs. I have used this concept in the examples of gardening reconstructions that I present below.

The subjective position of the researcher within craft research is debated (Eriksson et al. 2019). It is seen as valuable in some areas of experimental archaeology (Petersson and Narmo 2011, 28) and as possible bias in others (Reynolds 1999, 158). Within craft research, one risk with the subjective position is that the personal experience, skill, norms, and craft are understood as the right way to perform craft (Melin 2018). This hazard can be handled through deconstruction of one's own craft in order to understand historical craft. This approach is further discussed in this chapter. In my craft research, no other approach is possible. It is closely linked to the environmental psychology of Gibson and also, to some extent, phenomenology (Gibson 1979).

My research has been focused on the question of how lawns and hedges were managed in the eighteenth century. This approach is similar to one fundamental question within archaeology: "How was that done?" (Orton and Hughes 2013, 140). Experimental archaeology is a field within archaeology with resemblances to craft reconstructions. One aim of experimental archaeology is to create objects or products equivalent to archaeological artefacts and thus to shed light on the original technical and social circumstances in which they were produced (Petersson and Narmo 2011, 28).

In the 1990s, historical cultures started to be studied within archaeology through bodily experiences but only rarely including senses and emotions (Petersson and Narmo 2011, 39), with Michael Shanks (1992) and Christopher Tilley (1994) as exceptions. To incorporate senses and emotions into archaeology as scientifically valid has been a challenge, whereas in cognitive sciences and philosophy they constitute an accepted field of study (de Sousa 2010; Petersson and Narmo 2011, 44).

The humanistic approach within experimental archaeology was developed by Petersson and Narmo:

> We argue for the integration of technical, sensory and emotional understandings of the past, so that the notion of being a human in a long-term perspective can be included in the concept of ex-

> perimental archaeology. A *humanistic experimental archaeology* is achieved by the development of new methods such as conscious use of anachronisms, renewal of techniques for documenting and communicating experiments, and use of the human body and senses as an experimental field. (Petersson and Narmo 2011, 28)

The approach and methods of humanistic experimental archaeology offer themselves to craft research and open up the opportunity for craftspeople to contribute to experiments. Experimental archaeology often consists of teamwork according to agrarian historian Catarina Karlsson: "Here, the technically knowledgeable and the skilful in craft are united with the ones with theoretical and archaeological knowledge. In rare cases these are united in the same person" (Karlsson 2015, 24).

RECONSTRUCTIONS IN A GARDEN CONTEXT

When reconstructions are made within a garden context, it is important to describe the specifications of gardens. Gardens consist of three elements of cultural heritage:

1. The structural elements, the built heritage.
2. The plant material.
3. The gardening craft.

These three elements are intimately connected and dependent on each other; nevertheless, all contain their own qualities. In relation to reconstructions, the structural elements and the plant material can be considered to be objects and the gardening craft can be described as a process. Since this is a study in the gardening craft, focus is on *processual reconstruction.* However, gardens are a living heritage in contrast to other heritage objects. Living things change and thence gardens change. In fact, change is built into the very nature of gardens (Flinck 2013, 18). The term *management of change* is highly relevant in the management of gardens (Gwilliams and Worthing 2002).

In both the built heritage and in experimental archaeology there is often reference to original objects (Högseth 2007; Schenck 2015, 151; Högseth in this anthology; Leijonhufvud in this anthology; Nyström, Palmsköld, and Knutsson in this anthology). The construction process is then reversed. What do I have to do to create a similar item? If a processual reconstruction is done and you end up with an object similar to the reference object, you surely have a strong hypothesis. This is not the case with gardens. There is no answer or reference object since the garden is living and ever changing. The only thing to hold on to is the tools, image sources, text sources, and the experience of the craftsperson involved.

> The garden in itself does not provide clues for these types of craft experiments. Traces of tools and management techniques vanish quickly on living material like the lawn unlike the traces by building craft in a historical building. (Seiler 2018, 10)

THREE CASES

The First Case: Reconstruction of Eighteenth-century Lawn Management

This case does not provide a comprehensive description of eighteenth-century lawn management (but see Seiler 2018). Here, the focus is on processual reconstruction. When it comes to eighteenth-century gardening practices, some are still alive as a tradition and some have to be reconstructed. Eighteenth-century lawn management consisted of the use of three main tools and operations: rolling with the roller, mowing with the scythe, and collecting the clippings with the birch broom.

The work started the day before the mowing, with rolling to take away the worm casts. The next day it was time for mowing the lawn with the scythe before the grass clippings were finally collected with a birch broom and taken away in a basket and/or wheelbarrow (Mollet [1651] 2006; [1670] 2007, 9; Lundström 1833, 128–30; Seiler 2018, 13–14). The use in Sweden of rollers on lawns for management purposes has long since vanished; in fact, there is no evidence that rollers have been used at any point after the shift in technique from scythe to mower in the first half of the twentieth century in Sweden. The roller is still used today but for other reasons; light metal grid rollers are used when lawns are constructed to flatten the ground. The use of the roller in a lawn management regime has to be reconstructed; it is not a living tradition.[1] The reconstructed practice showed that high levels of skill are not required by this specific tool and for its operation. The struggle was to get hold of the tool because it was not already in our toolshed and it was not widely available on the tool market. I solved this by buying a second-hand, rusty, heavy, metal roller filled with cement weighing about 100 kg and a new metal roller that could be filled and emptied with water to adjust the weight. The reconstruction here was not a serious tool reconstruction because the descriptions of the tool in the historical sources showed a variety of materials and designs (Mollet [1651] 2006; Abercrombie 1789, 496–97). The important feature of the tool was that it was heavy enough to compact the material it was rolled over (lawns or pathways) and that the surface was smooth. There are descriptions of wooden rollers, metal rollers (like cast iron), and stone rollers. The smallest could be pushed or pulled by a single person and the largest ones were drawn by horses (Abercrombie 1789, 496; Wimmer 2011, 167–68). In this case, the reconstruction was not a tool reconstruction but a reconstruction of the practical operation and the result it produced on the lawn. The roller does not make sense in a contemporary fine lawn management regime, where the grass is mowed at least once a week and the ground stays solid. However, in a Swedish eighteenth-century lawn management regime, the lawn is mown approximately every third week (Lundström 1833, 130). This leads to a soft and uneven ground with a great number of worm casts. They have a negative effect on the aesthetics of the lawn (where the ideal is a smooth velvet carpet) and on the sharpness of the scythe blade (Loudon 1843, 326).

Nevertheless, my experimental research shows that the roller makes perfect sense together with the scythe and the birch broom in eighteenth-century lawn management and thus confirms the seventeenth–nineteenth-century sources (Mollet [1651] 2006; [1670] 2007, 9; Abercrombie 1789, 496–97; Lundström 1833, 128–30; Loudon 1843, 326). This could be said to be an example of both time-gap-apprenticeship with the reconstruction of a long-gone practice and of acting in relation to the affordances of the lawn in the garden today (Kelly-Buccellati 2012, 204; Gibson 1979). The latter demand the continuous adjustment to the situation by the practitioner. The height of the grass is one affordance, the dew in the grass is another, the strength of the wind is yet another affordance, and the sun in the sky one more. The practitioner has to continuously adjust their making in relation to all of these changing affordances of his environment.

The important thing with the roller, apart from being both smooth and heavy, was not the level of skill of the practitioner but the strength to push and pull the tool. An experience from the experiment was that it was easier to pull than to

Figure 2: Making practical research: Joakim Seiler mowing the lawn with the scythe in the eighteenth-century gardens of Gunnebo House that are used as the craft laboratory. The research does not only include the making but also the documentation of the making in texts, still images, and video recordings, allowing an analysis of the making in hindsight. Photograph by Malin Arnesson 2017.

push owing to the help of the body weight when pulling. This was done through pulling the tool behind your back with both your hands and with your body leaning forward to use your body weight in the operation. The use of the body weight was especially necessary when starting the movement of the roller; once it was moving, it was very easy to keep on rolling. Some power also had to be used when the roller needed to be stopped at the end of the lawn. When rolling the edges of the lawn, or when coming close to other objects, the body position was changed so that you were still pulling but at the same time looking at the tool and walking backwards. In this way, the exact position of the tool could be seen and directed. The experiments were primarily done with the second-hand metal/cement roller.

When it comes to the scythe, the tool and its use have moved out from gardens and into the landscape (Figure 2). Using a scythe is still a living tradition in meadows. The scythe practice is a living tradition; however, the gardeners that have lost the traditional knowledge of mowing lawns with scythes need to learn from the tradition bearers that know and practice mowing meadows. When the practical skill is accomplished, the eighteenth-century practice of mowing the lawn with scythes has to be reconstructed—an example of time-gap-apprenticeship (Kelly-Buccellati 2012, 204). I am the apprentice and John Abercrombie in the late eighteenth century is the teacher. In this case, one can speak of a living tradition that has to be adjusted to gardens and their affordances (Gibson 1979, 127). Reaping meadows with the scythe could be said to be an *intangible cultural heritage*; lawn management with scythes is not an intangible cultural heritage in Sweden since it has to be *reconstructed* (UNESCO 2003).

Finally, my research indicates that the birch broom is not a living tradition in Swedish public gardens. The practice with the birch broom on lawns in gardens also had to be reconstructed. The tool was not present in the toolshed at Gunnebo House and was not readily available on the market; it required some searching to acquire it. Another highly relevant way had been to learn to construct the tool ourselves, as was done by gardeners in the eighteenth century (Abercrombie 1789, 500). In the operation, when the grass clipping of the lawn was collected with the birch broom, a new situation occurred. The practice did not build on previous experience nor on prejudice. Since the tool was not known to us in advance, we tried to test it with an open mind. We did not know what to expect from the tool and were curious about its function. In this case, it was primarily the affordances of the tool and its functionality that were investigated.[2] The tool was functional for small surfaces and pleasant to use. The affordances of tools differ from the affordances of nature. The forces of nature cannot be directed by the practitioner. The amount of dew, wind, sun, and rain is beyond our control. However, the affordances of the gardening tools might to some extent be adjusted by the practitioner. If the scythe is too blunt, it can be sharpened by the practitioner; if the broom is too loose, it can be tightened.[3]

An aspect of processual reconstructions stressed by Almevik is the *rationality* (2011, 167). He describes this as "a path to knowledge through the inner logic and rationality of the practical work. It is important to stress that it, in this case, is a question of inner rationality" (Almevik 2011, 167). When every tool and operation in eighteenth-century lawn management is scrutinised on its own, it is hard to see the rationality. However, when they are combined, rationality emerges. The rationality of these tools and operations exists in its own right, not in comparison with the time efficiency of power tools or other management. The combination of the roller, the scythe, and the birch broom, in that order, has its own rationality and this is a clear result of the processual reconstruction of the eighteenth-century lawn management in the Gunnebo garden laboratory (Seiler 2018, 18). This rationality does not evolve out of the historical sources on their own; instead, it is developed based on the historical sources, the experiments, and the affordances that are given back to the practitioner/researcher by the tool and the garden element.

Another aspect in the development of knowledge is "through code competence and the interpretation of signs" (Almevik 2011, 167; see also Sjömar 2017, 109–13). In this case, code competence is the competence developed through long experience of a craft by craftspeople which provides them with tools to interpret descriptions of craft practice and traces of craft procedures in objects. An example of this is in relation to the scythe mowing of the lawn. When the scythe is used to mow the lawn, it has to be sharpened approximately eve-

Figure 3: Cleaning the scythe blade with a textile cloth before sharpening with the whetstone—a practice-based solution to a problem that proved to be recommended by Abercrombie in the eighteenth century as well. Photograph by Daniel Lundberg 2012.

ry five minutes with a whetstone. When mowing, the scythe blade gets covered with grass clippings. Before the whetstone can be used, the blade has to be cleaned. When cutting meadows, the traditional way of cleaning the blade is with a handful of hay (M. Rosengren, personal communication 2012; Stenholm Jakobsen 2015, 109). This is functional and safe; you do not use your hand and fingers close to the sharp edge. However, when mowing a lawn, the grass clippings are short and do not work as a cleaning cloth. My solution to this problem was to start using a textile cloth. I came up with that solution during the experiment; it was an example of experience-based problem solving and was not based on historical sources. It was the result of the affordances of the situation in relation to my own code competence. Some years later, I studied *The Complete Kitchen Gardener*, written by the eighteenth-century Scottish gardener John Abercrombie. He writes the following:

> […] in order for whetting or sharpening the scythe, both at first setting in, and afterwards occasionally, as the edge blunts, […] ready as wanted for whetting as he advances in the mowing, as also *a large woollen rag or cloth, with which to wipe the scythe clean and dry, previous to each whetting; otherwise the stone would glaze and not make a proper impression in whetting or sharpening*. (Abercrombie 1789, 506, my emphasis)

My experiments and struggle with methods for cleaning the scythe blade before using the whetstone provided me with code competence to understand the description by Abercrombie. Abercrombie does not write out how the scythe blade gets dirty or what kind of dirt it is. My experiments fill in the gaps in the historical sources and open a dialogical connection to Abercrombie. My practice explains the eighteenth-century source, and the source explains my practice. This is one example of time-gap-apprenticeship, as well as working in dialogue with the affordances of the tools and the garden element in practice.

The Second Case: The Lawn of André Mollet as a Processual Reconstruction

The second case of a processual reconstruction was the construction of the seventeenth-century lawn that had been made at Gunnebo in 2017 according to the instructions by the royal gardener André Mollet from 1651 and 1670. In this case, I have not focused on the lawn as the result; instead, the main interest is the knowledge content derived from the reconstruction process. Mollet came from a family with three generations of royal gardeners and with a comprehensive knowledge in gardening. In his book, *The Pleasure Garden* ([1651] 2006–2007), he described how lawns should be made from pastures where sheep grazed. The description is short and general and does not say much about the gardening operations or the tools that are needed, except for the slicer to cut the pieces of turf vertically. However, a traditional tool used in construction of lawns was the turf beater that was used to beat the pieces of turf horizontally into place in the garden (Abercrombie 1789, 492).

In our experiments with the turf beater, we performed some observations. One was that the turf beater had the wanted effect in relation to the ideals for the lawn described in the seventeenth–nineteenth-century sources. Through the vertical beating on the turf sheets with the turf beater, the surface was made level, both within a single sheet of turf and between different sheets of turf. The turf beater that we had reconstructed was suitable, although it was a rough pilot reconstruction of a tool that we had never seen in reality. The head of the tool, which was used to beat the ground, was made out of a thick and heavy wooden board just like some of the turf beaters that we had seen in historical images (London and Wise 1706, 252; Loudon 1845 136; Nicholson 1884; *The Encyclopedia Britannica* 1893). The tool had a weight distribution, or balance, that resulted in *the tool doing the job*. It did not require much strength to use the tool and get results from its use. The handle was unnecessarily long and thick but apart from that was functional. The reinforcement that was made where the handle meets the head was a solution of our own to make the head stick to the handle. The historical tools do not have reinforcements like that. That means either that the carpenters or gardeners who made the tool were qualified to make a solid attachment without a reinforcement or that the tool should not be used with power and thence did not need a reinforcement at this point. To investigate this, further experiments need to be carried out with and without reinforcements on the tool and with more or less power in the practice.

Another observation was that when the tool was beaten hard onto the turf, the sharp edges of the tool cut into the turf and made cut marks. Based on this observation, two considerations can be made: either we modify the historical tool so that it fits our practice or we adjust our practice to the historical tool's design. Within this question, there

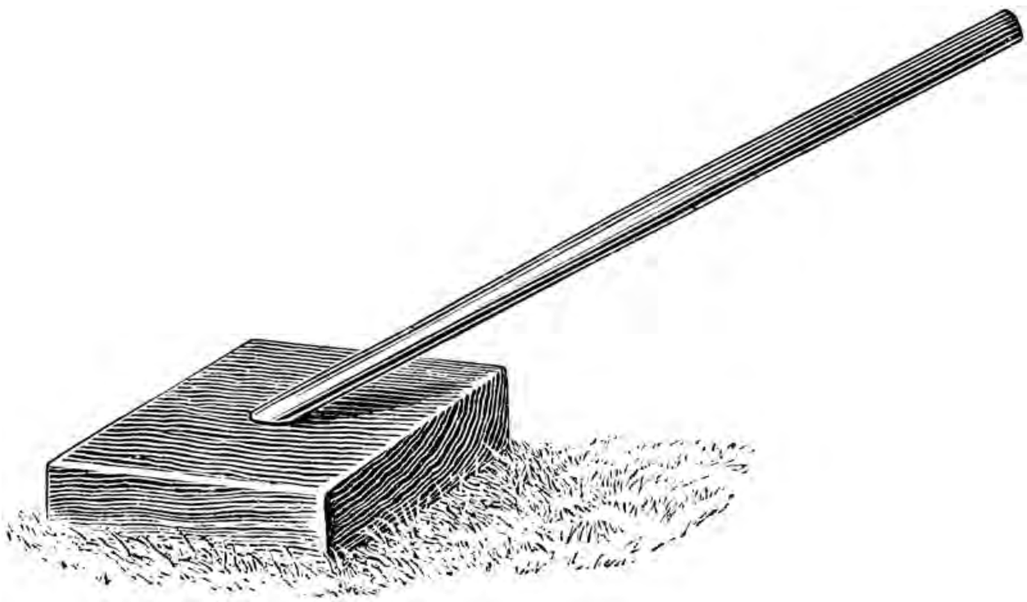

Figure 4: The turf beater as shown in *The Illustrated Dictionary of Gardening* by Nicholson (1884). Note the thickness of the wooden head and that there is no reinforcement between the handle and the head.

is a principle difference in how we go about the craft experiment which depends on whether we base the experiment on ourselves, as craftspeople, or whether we deconstruct our craft experience to learn from the historical tools (Melin 2018). A reconstructed historical tool can potentially teach us much about historical practice.

A practical point in relation to the turf beater is that more historical sources about the tool have been found since the construction of the lawn in the autumn of 2017, and this fact, in combination with the experience of the practical experiment, can allow us to make a more advanced tool reconstruction. The first tool and practical experiment can be seen as a pilot study. However, this is perhaps to provide a false description because this is a processual reconstruction where the growth of knowledge happens gradually during the whole process.

To conclude, the results of this particular experiment were not a reconstructed lawn (object) since there is a need for a longer amount of time for this reconstructed element to develop through its own life and through the historical management applied on this garden element into a reconstructed seventeenth-century lawn. Neither is this experiment a reconstruction of a historically accurate tool. One of the results of this particular experiment is the fact that even though the reconstruction was a rough pilot, the turf beater, as a tool, worked properly as intended in the historical sources. Another result was to learn to be guided by the historical tool and not to modify it in accordance with our current craft norms. To link this to Gibson, knowledge developed when we paid attention to the *affordances of the historical tool* (1979, 127).

Figure 5: The pilot reconstruction of the turf beater in use, autumn 2017. The tool was 222 cm long and the weight was 4550 g. Photograph by Nina Raun.

The Third Case: Reconstruction of Eighteenth-century Hedge Management

When historical sources were searched for information about tools and methods for hedge management, I found tools other than traditional hedge shears. A number of sources speak of billhooks or swords for cutting hedges (Dézallier d'Argenville and Le Blond 1728, 187–88, 200; Andrén [1787] 1951, 66; Abercrombie 1789, 487–88; Müller 1857, 63). The definitions of the tools are unclear and contain many regional varieties across different countries in Europe. My research indicates that these tools did not have proper names in Swedish; instead, they had descriptive or metaphorical names like *huggsvärd*, which means slashing sword.

Two other eighteenth-century tools for clipping hedges or palisades were found in different sources. In the English virtual tool museum, the pruning hook and the hedging slasher were found and in the encyclopaedia by Diderot and d'Alembert a depiction of the work with pruning hooks (Plate I) and the tool itself (Plate II) (ARTFL 2017). Based on these sources a first reconstruction of the tool was made and tested in the autumn of 2017.

In English there are four specific tools for managing hedges with specific names: the billhook, the hedge slasher, and the pruning hook, in addition to the more common hedge shears (Oldgardentools). It is possible that the Swedish *huggsvärd* is similar to a billhook or a hedge slasher, since the name indicates a short handle. A sword usually has a short handle and a long blade and therefore the long-handled pruning hook was not likely to be the same as a *huggsvärd*. Image sources like the *Encyclopédie* by Diderot and d'Alembert also show pruning tools for hedges and trees (ARTFL 2017). On Plate I the pruning hook is shown in action. The French name for the tool is *croissant*.

In my research, a number of reconstructions of tools for cutting hedges have been made. In some cases, this has involved *tool and practice reconstructions*; in others, the tools could be bought but the *practice* with the tool had to be reconstructed. One example of *tool and practice* reconstruction is the reconstructed *huggsvärd* or *billhook* from the tool illustration by the Swedish gardener Peter Lundberg (Figures 6 and 7) (1763). In my research, a sample of the book from 1754 at the Royal Library

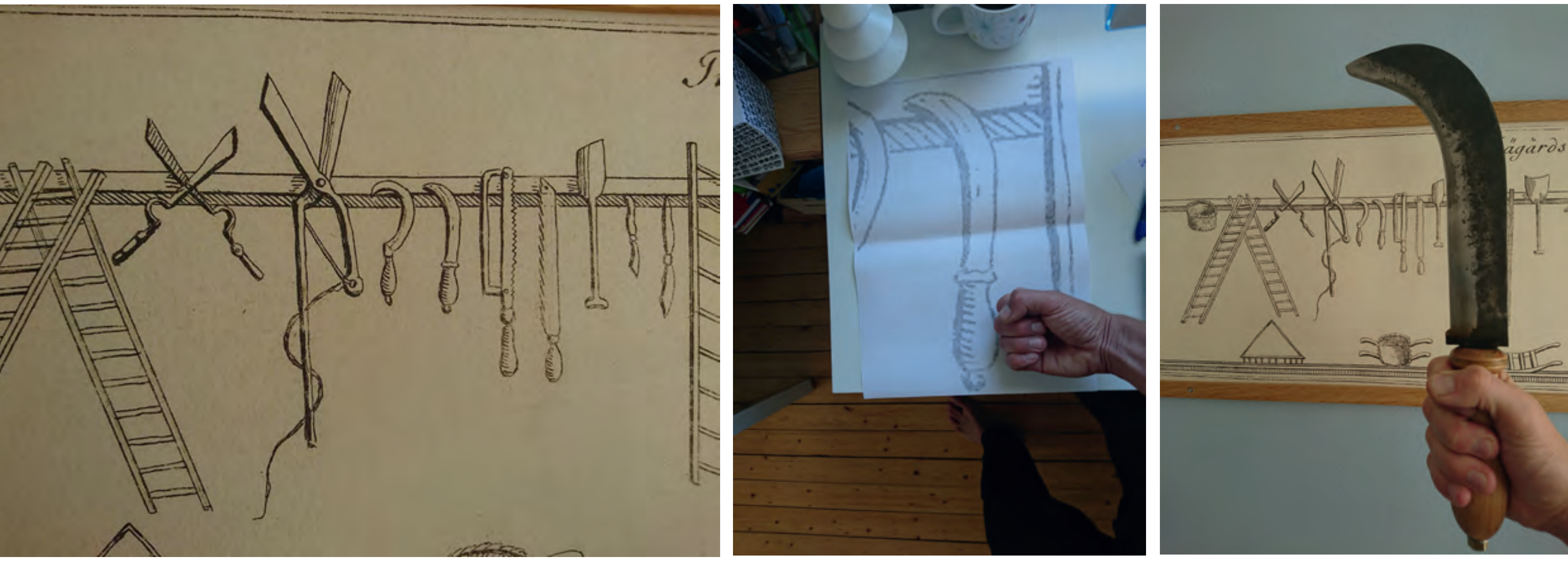

Figure 6–8: (Left) Detail of the tool chart from Peter Lundberg in 1763. Notice the odd scale of the different tools: the rake is barely as long as the garden spade. The garden spade is as long as the hand tools. There are no measurements on the chart. (Middle) My hand used as a yardstick for the eighteenth-century Lundberg billhook. When the tool on the chart was enlarged enough to fit my hand, I decided to reconstruct the tool in that size. (Right) The reconstructed tool and the tool chart. Photographs by Joakim Seiler.

[Kungliga Biblioteket] has been used where all the engravings are missing; consequently, a sample of the second edition from 1763, with all engravings included, has also been used. It is a valuable source of information about horticultural tools in eighteenth-century Sweden. However, when scrutinised with source criticism, there are no measurements on the chart and the scale of different tools is strange. For instance, the ladder is as large as the pruning saw and a garden spade. The tool chart, nevertheless, represents a valuable source of information for the craftsperson as it provides a figurative depiction of the tools.

How could these tools be reconstructed if the measurements of them are unknown? I applied a practical approach: hand tools are meant to be used by hands and the handle of them should fit into either one hand or two hands, depending on whether they should be used with a one-handed grip or a two-handed grip. I interpreted the tool as one with a one-handed grip. Consequently, I used my hand as a scale for the tool and made a reconstruction that was fitted to my hand. This is the way the question of tool size was solved. In a practical reconstruction, there is no use trying a tool that is too small or too big for the hand to hold.

When the size of the tool had been decided, a tool smith was given the assignment to forge the blade and a carpenter at Gunnebo made the handle. Both the blacksmith and the carpenter followed the design on the chart. The tool on the two-dimensional chart was interpreted into a three-dimensional tool. The form of the blade and the handle was clear from the chart; however, the thickness of the blade and the handle could not be seen in the chart.

Once the tool was reconstructed it was taken out into the garden to be tested. A methodological danger is present if experiments are performed with tools that have the wrong weight, cutting edge, or balance. It would possibly produce different results than if a more accurate reconstruction based on a preserved historical tool had been used. Nevertheless, the tool was tested in both the winter pollarding of the lime trees and for cutting lime and hornbeam hedges. The general impression of the tool was that it had a blade that was too thick for the purpose of cutting hedges and small branches. The iron blade had some resemblance to an axe blade—thick and heavy. To make the tool work, the blade had to be really sharp. The part of the operation that required the most skill was the sharpening of the tool. The short handle limited the reach when cutting hedges.

To conclude, in its current design with the thick iron blade, the first alternative for this tool would be as a billhook in landscaping and not for fine gardening hedge-cutting. A second alternative would be to make the tool more suitable for gardening purposes; it would imply making the blade thinner. The collection of tools on the tool chart by Peter Lundberg (1763) is for gardening use and this indicates that the second alternative would be the likely one. This tool reconstruction is an example of processual reconstruction: a tool is reconstructed and tested in practice and, through that process, knowledge develops, allowing a more proper reconstruction of the tool which in turn makes the practice more functional. Step by step, knowledge develops in the dialogue between practice and the historical sources.

Another possible development would be to compare the reconstructed tool with preserved historical tools of the same kind; of special interest is the question *how thick are the blades*?

DISCUSSION

The definition of reconstruction and tradition in this text has to do with what practices are living traditions in Sweden today and what practices are not. There is a clear difference between continuing practice within a living tradition and reconstructing a lost practice. To learn practice within a living tradition involves passing on knowledge and teaching skill from a living teacher to an apprentice. One important stage in this learning process is the correction and feedback of the teacher when looking at the practice of the apprentice. This feedback and correction secures the functionality and the tradition of a specific practice. The result of this practice is a clear statement: this is how it is done within this tradition. When practice has to be reconstructed, it is significantly harder. There is no living teacher who can correct and provide feedback. To reconstruct knowledge and skill requires more effort than continuing living practice. And the result of the practice is indicative, not conclusive; the result indicates that this is how it could have been done (cf. Orton and Hughes 2013, 143). In some cases, practice has vanished and has to be reconstructed. In these cases, the question of context is highly relevant; this applies to processual reconstructions, as well as experimental archaeology, where original tools, operations, and circumstances are among the resources. These resources meet the craftsperson of today with their knowledge, skill, and concepts. Craftspeople of today tend to use their experience

Figure 9: The tool tested on lime hedges by a gardening student in the garden. Photograph by Joakim Seiler 2017.

also in heritage conservation as a true measure and so it is assumed by them to be the right way of practicing a craft. This is a challenge for all craftspeople performing reconstructions. The contemporary norms about craft have to be deconstructed in order to understand historical craft (Melin 2018, 3).

To be able to reconstruct eighteenth-century gardening, I have to deconstruct my gardening of today. However, I surely can and should use my practical experience, but with the same source criticism as other sources of information. This leads on to the question of *how do I apply source criticism to my own experience*? In experimental archaeology and building conservation, there are often reference objects to rely on that verify the reconstructions (Petersson and Narmo 2011, 28; Schenck 2015; Smith 2016, 217; Melin 2018). In gardening, however, there is a lack of earlier examples; for instance, no eighteenth-century lawn exists that can act as a reference object. This makes "acquisition of that (earlier) knowledge by a later craftsperson based on earlier examples" (Kelly-Buccellati 2012, 210) problematic. Instead, image sources, texts, and sometimes preserved tools must be taken as reference material for the reconstruction (cf. Smith 2016, 217; ARTECHNE 2020).

In some cases, the only thing that is left of eighteenth-century gardening is the tool or an illustration of a tool. In these circumstances the meeting of the experienced craftsperson and the tool is the point of knowledge production or reconstruction. One could speak of the *object affordances* of the tool given to the practitioner (Gibson 1979, 127). The tool leads the practitioner into functional practice through experiments with the tool. This process leads to a hypothesis about eighteenth-century practice or, in other words, a functional way of using the tool and getting a satisfying result. The hypothesis states that *this is how it could have been done in the eighteenth century*.

Although there are clear similarities between experimental archaeology and craft research, as we have seen in this chapter, there are also differences. The archaeologist Alan Outram is critical towards re-enactment, experiences, and demonstrations, and stresses that "from an academic point of view, it is clearly beneficial to maintain a clear distinction between what is 'experimental' and what is 'experiential'" (Outram 2008, 3–4). The humanistic approach within experimental archaeology, however, opens up for the contribution to science from personal experience (Petersson and Narmo 2011, 24). In craft research, experience and skill are crucial. In processual reconstructions within craft research, experience and skill constitute the fundament of knowledge production; in the experimental archaeology of Reynolds and Outram, on the other hand, they represent possible bias (Reynolds 1999, 28; Outram 2008, 3–4).

In my experiments, time was measured. However, these measurements and, in fact, the whole experimental result must be seen in the light of my very limited experience of using the tools. Still, time efficiency is something that craft experiments can provide answers to.

A continuation of the tests can produce the necessary experience to possibly gain a deeper understanding of the original production situation where the work was done day in and day out every summer for many years, not only for some hours or days during a craft experiment. The next step in the reconstruction process is to reconstruct the original production situation. One aspect that has already been seen in the tests is that it is important to perform the experiments for a long time. If you test a tool for a short time, you can compensate bad technique with muscular power and get a decent result. However, if you test the tool for a long time, you get tired and the ability to compensate for bad technique with muscular power decreases. In this state you have to develop good technique and proper use of the tool, and this takes you nearer to the original production circumstances (Melin 2017, 97).

Gardening is often understood as a process of operations that follow each other step by step, leading to a specific result. This is a streamlined and simplified explanation. A step-by-step instruction of a craft procedure can be helpful but is nowhere near the realistic situation, especially when it comes to gardening, where the forces of nature constantly change the affordances given to the practitioner. This text indicates that processual reconstruction is a useful research methodology that can be applied in other craft research as well as in craft education.

The use of reconstruction of practical gardening methods in this study is a conscious and specific choice. It consists of three stages. First, the eighteenth-century gardening tool has to be either bought if it is still in production, or reconstructed based on eighteenth-century sources if it is not. This stage can be considered as the traditional object reconstruction or *material reconstruction* (Almevik 2011, 161). The second stage of reconstruction is to use the tool in the garden. This requires a fundamental understanding of how to conduct a craft inquiry. Traditional tools and methods often require some degree of skill in contrast to many twenty-first-century garden tools. Many, but not all, traditional tools either demand experience of using the tool by the practitioner or sufficient time spent practising with the tool to conquer the craft skill. Often, weeks are needed to develop a skill resembling a historical production situation. Sometimes, no other source of information but the tool itself is present. More often there are a number of sources of information: eighteenth-century images and texts providing information about the tool and its operation, and sometimes even accounts of the results of the work of the tool. In this situation a triangulation of information is possible: the eighteenth-century sources being one point, the tool itself and the physical surrounding being another, and, finally, the skill and experience of the gardener mark the third point. This second stage can be said to deal with *gardening craft*. The third stage of reconstruction is the result of the operation of the tool on the garden element. The traditional way of developing knowledge is by analysing eighteenth-century sources and, for instance, trying to understand how an eighteenth-century lawn looked: its evenness, the height of the plants, the composition of species, and the aesthetic appearance. In this research another path to develop knowledge is taken: by performing the gardening operations with the traditional tools on the garden element, a reconstructed result is produced. This is what I call *reconstructive management* and it means that the management activities themselves and their result on the garden elements are reconstructive.

CONCLUSION

Gardening is not performed step by step and through following an instruction book. It is accomplished in constant dialogue with the affordances of the surrounding elements: the weather, the garden elements, the visitors and colleagues, and the garden tools. In *gardening craft reconstructions* another element enters the dialogue as well: historical text and image sources. They inform practice and practice speaks back to them by developing a deeper understanding of what they say, as this chapter has shown.

In my craft research the concept of *time-gap-apprenticeship*, invented by Kelly-Buccellati, has been useful. Nevertheless, I agree with Melin that the present-day craft practice cannot be used as a yardstick for historical craft practice. The concept of time-gap-apprenticeship must be used through the deconstruction of today's craft norms and practices in order to really understand, and be able to reconstruct, historical craft practice of a certain era.

In both the repetition in the everyday work and the work within a tradition there are clear elements of continuity. In reconstructions, however, continuity has been broken. This chapter has offered some answers to the question of *how reconstruction of craft can be used as a method to advance our knowledge about history*. It has showed how the traditional gardening tools, if taken into practical operations and not only studied as museum objects, can contribute to our historical knowledge. It has also shown how reconstruction of practice offers a unique method of developing knowledge and understanding of historical practice. The chapter has also highlighted potential pitfalls with craft reconstructions as a method when the norms of craftspeople today are used to interpret historical tools and practice.

Both the similarities and the differences of experimental archaeology and craft research have been characterised. One major difference is that dealing with gardening means dealing with living and ever-changing material. Consequently, in gardening reconstructions, *no reference objects* in terms of authentic lawns or hedges can support craft experiments. The result of the experiments therefore can only be hypotheses about historical practice. The hypotheses state that *this is how it could have been done in the eighteenth century*. That is as far as we can get in a historical study when dealing with the living and ever-changing heritage of gardens.

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ENDNOTES

1. By the concept of *management regime*, I refer to all management activities that take place in relation to a specific garden element and also the norms, resources, ideals, and societal circumstances that affect the management.

2. See introduction to the concept affordances in the section on methodology in this text and in Gibson 1979.

3. For a more comprehensive description of the experiments with the birch brooms, see Seiler 2018.

CRAFT INTERPRETATIONS

In the theme Craft Interpretations, the chapters display the value of the practitioner-researcher's knowledge and experience of craft practice in multidisciplinary contexts and in relation to education. In the chapter "Traces of a Textile Tradition" Annelie Holmberg is using her own craft knowledge to interpret the different types of textile manufacture and how the traditions have changed over time. Fredrik Leijonhufvud, in the chapter "Interpretation of Boats in a Craft Tradition" is trying out different methods of documenting old clinker boats through which he is decoding craft knowledge. In this process he is using his own experience of building traditional wooden boats. Similarly, ceramist and archaeologist Katarina Botwid is utilising her specific knowledge about ceramic crafts in her interpretation of archaeological findings in the chapter "Craft Knowledge in the Service of Archaeology".

Annelie Holmberg is associate professor in Textile Studies, Department of Art History at Uppsala University, Sweden. Holmbergs research mainly focuses om the learning of practical, textile, skills. The studied learning can be situated within vocational or academical spheres as well as within professional textile studios. In accordance with the research tradition within Textile studies, the theoretical and methodical approach is object based and uses a practical knowledge in textile craft. A general knowledge about textile craft and specific knowledge of weaving, obtained by education and work experience from a textile studio and teaching, forms the basis in the practical knowledge.

KEYWORDS: Craft analysis, interlock, situated knowledge, tapestry studio, textile craft, weaving.

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Traces of a Texile Tradition

By Annelie Holmberg

INTRODUCTION

Can knowledge of craft be used as a tool in a qualitative scientific analysis? As a weaver, the answer is, of course, affirmative: knowledge of craft must be treated as any other (deep, documented) knowledge base held by a researcher. The overall focus of this chapter is to give an example of what—and how—knowledge through a practitioner's perspective can contribute towards a deeper understanding of a craft tradition. An example of how such an analysis can be performed is presented, as well as examples of results from the analysis. The craft tradition examined in the analysis is the weaving of tapestries and the craft methods used by weavers to create them in several tapestry studios in Europe. The specific aim of this chapter is to show, through an analysis of the textile technical detail of interlocking, how a situated knowledge within a community of practice (Lave and Wenger 1991; Nielsen and Kvale 2000) can be preserved or changed. The concept of craft tradition is here used as a wide concept, constituted by, for instance, the learning, making, and (studio) identity within a tradition. Choices of techniques, technical solutions, materials, and tools are all part of the making. A craft tradition can be affected by time, geography, and personal impact, to give just three examples (Holmberg 2015). Here, the tradition is constituted by the professional making of a specific category of artefacts—tapestries. This tradition consists of (local) craft traditions within different studios/communities of practice.

The interlock is a technical solution used by the weaver when two wefts, the horizontal thread system in weaving, from opposite directions meet in a weave (see Figures 1–5). This meeting occurs when yarn from two different colour fields are next to each other, or when weaving with several wefts within the same colour field to prevent the weft from shrinking when finalised. An interlock, or lack thereof, is seldom created with an ambition to be noticed. Despite this, the interlock can be seen if you look closely at a tapestry. It often appears as a little knot or a small hole, depending on the method used. The focus of this chapter is upon interlocks in tapestries. This is important to outline since interlocks can be used in most kinds of weaving; for instance, interlocking is commonly used in rug weaving techniques. It is also important to state that methods for interlocking differ between tapestry studios and across time (Holmberg 2015). This chapter analyses the use of interlocks across different studios over time in order to elucidate how a craft tradition has changed through the weaver's use of a particular technical detail.

Artefacts contain information (McClung Flemming 1974; Glassie 1999; Riello 2009). To see and understand this information requires knowledge, not only about the artefact's context, but also pertaining to an ability to read the artefact and to understand what factors made it what it is today. Representatives from the subject of Textile Studies at Uppsala University in Sweden consider the ability to read a textile artefact as being dependent on possessing knowledge in textile crafts (Candréus 2008; Aneer 2009; Dahrén 2010; Holmberg 2015). For example, embroidery- and tailoring perspectives or methodologies can be employed as the basis for an analysis of both an artefact and its context where the mentioned crafts are applied. Since this chapter contains an analysis of tapestries, knowledge in the art of weaving tapestries is essential. My practical knowledge in weaving consists of one year of education at the Friends of Handicraft School in Stockholm and a degree (BA) in the teaching of textile craft at Uppsala University. Further, my specific knowledge in tapestry weaving consists of a four-year apprenticeship at the Friends of Handicraft studio. Within my postdoc research in the subject Textile Studies, I have also studied the practical work of tapestry weavers and visited a number of tapestry studios. As a teacher of Textile Studies, I have educated students in basic weaving and tapestry weaving for nearly ten years. The subject of Textile Studies is organised within subjects of Humanities. From its very beginning, Textile Studies implemented a strict tradition of writing in a particular way, where the writer's craft knowledge is implicit in the text. This chapter can be seen as my attempt to change the way of writing, it is a way to visualise the importance of a practitioner's perspective in Textile Studies research. At the same time, I am educated within a tradition—a tradition which is visible in my text despite my efforts to change.

RESEARCH CONTEXT

Important as a manifestation of wealth, and practical in their ability to be moved between and in buildings tapestries have historically had a function within interior design. Tapestries have been—and still are—made with an intention to create an artistic expression, to affect the viewers or to create a specific atmosphere. The expression, traditionally and historically, consists of a composition: a picture mediated in textile materials. The medium is reliant on weaving techniques. Historically, the technique used has been the weft ribs technique,[1] which refers to a structure where the warp is invisible and the visible weft creates the pattern (Geijer 1972, 59). The technique can be seen, for instance, in Coptic fragments of tapestries dating from between the third and the fifth centuries and in medieval tapestries from Germany, Switzerland, and France

(Geijer 1972, 112–15). The choice of material for warp and weft has a direct effect on the tapestry's expression. The material in the warp mainly affects the structure of the weave's surface, while the material in the weft affects the main expression of the tapestry and if he tapestry is shiny or lustreless. The weft in tapestries of different times and cultures has most frequently been of wool and/or silk, though metal thread has also been frequently used. Textile artist and author Anni Albers defines the concept of tapestry weaving as follows:

> Taken in its widest meaning, the term encompasses the various techniques that can be used to mark off different areas of color and surface treatment from each other in the woven plane. In a narrower sense, the term refers to a technique of weaving, or variation of it, where the weft thread, covering the warp completely, passes only over the surface of those sections of the weaving that are to be built of it. The thread then interlocks at the borderlines, either with neighbouring weft threads that meet it or with a warp thread, before turning back, after a change of shed, into its own field. (Albers 2017, 48)

Historically, tapestries have been produced primarily by studios. Today, tapestry studios still exist but the production of tapestries is more frequently connected to a textile artist and it is this artist who is understood as the producer of the tapestry. The looms used for weaving have varied across time, country, or studio. Such changes will be addressed later on in this chapter. The two traditional looms for tapestry weaving are the *haut lisse* and the *basse lisse*. The haut lisse is a high-warp loom and the warp is vertical; the basse lisse is a low-warp loom and the warp is horizontal (Soroka 2011, 8). A third kind of loom is also being used. According to Fiona Mathison, the use of this loom is connected to geography: "Much of the tapestry in Scandinavia is made on low cloth-weaving looms, and the relationship between cloth weaving and tapestry is often exploited" (Mathison 2011, 46). In the loom Mathison is referring to, the warp is horizontal and there is an upper construction for the changing of shafts.

This chapter analyses the weaving of tapestries in three textile studios. The choice of studios was motivated by an agenda to represent different methods for interlocking. Educating weavers and an awareness of the history of tapestry weaving is shared among each of the chosen studios, despite the establishments all being independent of one another. A textile studio manufactures textiles according to principles of craft, not principles connected to industry; this conclusion is based on my prior studies and visits to more than ten different textile studios (Holmberg 2015). The employed weavers are often tutored within the establishment according to the latter's own traditions, with the apprentice learning from a master.

The oldest establishment mentioned in this article is La Manufacture des Gobelins (Les Gobelins) which was founded in 1662, in Paris, as ordered by Louis XIV (Conradi-Engqvist 1994, 158). Since this establishment was commissioned to produce tapestries for the court, La Manufacture Royale Beauvais (Manufacture de Beauvais) was founded two years later to produce tapestries for private costumers (Conradi-Engqvist 1994, 165). Both of these establishments are still active today and are organised within Mobilier National, which services the French State with supplying and preserving interior design related products. A more recently established workshop studied in this chapter is Dovecot Studios, founded several hundred years later in Scotland, in 1912. The studio was initially founded with the ambition of making tapestries for its founder, the 4th Marquess of Bute. Today the establishment is a commercial studio in Edinburgh where tapestries can be commissioned (Cumming 2012). The establishment now consists of a gallery and a tapestry studio.

Additionally, two Swedish studios are part of the analysis. These studios differ from the international ones as they have produced both woven and embroidered products—not foremost tapestries.

In 1874, a group of women with aims both to preserve and to develop the Swedish textile tradition founded Friends of Handicraft (Handarbetets Vänner) in Stockholm. The production of textiles within this studio has always included products made through weaving and embroidery. Previously, the weavers and embroiders at the studio tended to be specialised in one technique, though today they are more flexible in their work. In the past and to the present day, the production consists predominantly of banners, stage curtains, liturgical vestments, and tapestries (Holmberg 2015). The second studio, Alice Lund Textilier AB in Borlänge, was founded in the 1930s by Alice Lund. Initially the studio's production had a focus on textiles for interior design, which changed in the 1950s and 1960s when a production of tapestries was initiated (Sangwill 1994). Today's production generally consists of woven tapestries and carpets, though products involving embroidery techniques are sometimes produced.

The production of tapestries within all of the aforementioned studios is reliant on the work of highly skilled weavers who are trained specifically in the art of weaving tapestries. The studios make their tapestries in collaboration with an artist who produces the sketch that is used as a model for the tapestry. The weaver—or weavers, since several persons often collaborate on the same production—interprets the sketch and meets with the artist continuously during the weaving process. The aim of such meetings is not only to evaluate the ongoing work but also to enable an understanding of the artist's intentions that are not always visible in the sketch. These meetings contribute another dimension, as the unspoken can be heard and the unvisualised can be seen (Holmberg 2015). An exception to this way of working exists at Dovecot Studios (and, for instance, West Dean Tapestry Studio), where many of the weavers are trained textile artists who sometimes use their own sketches for the production of a tapestry. This way of working was initiated in the 1940s when new apprentices were hired (Cumming 2012, 18) and is not a process found in Sweden (Holmberg 2015).

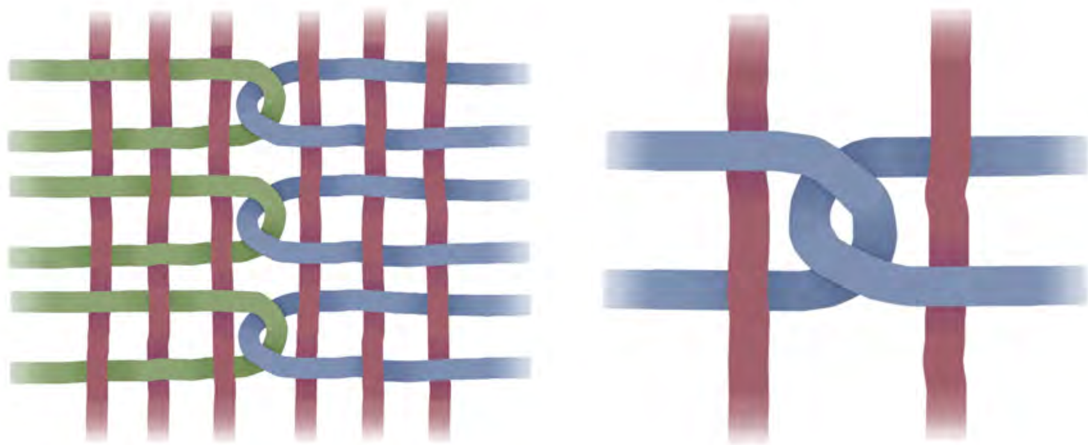
It is important to state that almost all of the establishments mentioned in this chapter have different forms of units—whether as galleries, shops, or places of education—within their operation. When I mention, for instance, Friends of Handicraft or Dovecot Studios, I refer to their production of tapestries, which takes place within their tapestry studios.

WEAVING METHODS

To make the reading of a text filled with textile terminology easier, the most important terms are defined below.

Single Interlock

When two wefts meet, they hook into each other. It is important in this method that the interlock follows the weave technique (here, a tabby or weft ribs). Collingwood (1978, 174) calls this "woven with contrary motion of wefts." This interlock can be woven from the reverse or face side (see Figures 1–2).



Figures 1–2: (Left) Face and/or reverse side. (Right) Close-up.
© Annelie Holmberg.

Double Interlock

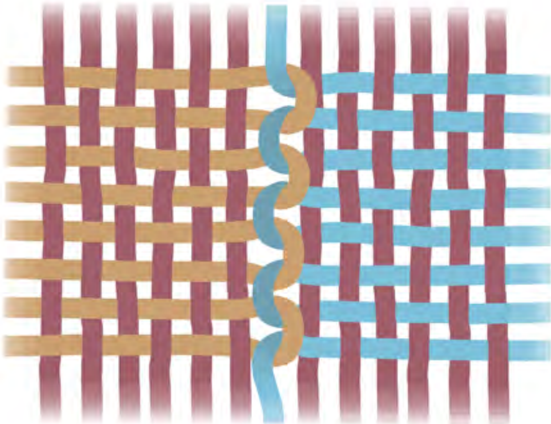
This interlock is characterised by the fact that the weft hooks over/into two threads before it weaves back into the next shed. On the reverse, a line similar to a 'chain' is being shaped in the direction of the warp. This method is almost exclusively approached through weaving from the reverse side. To weave this interlock from the face side is almost impossible since the weaver would have to create the interlock on the reverse side, which means working on the wrong side of the warp or between the warp threads (see Figures 3–4).

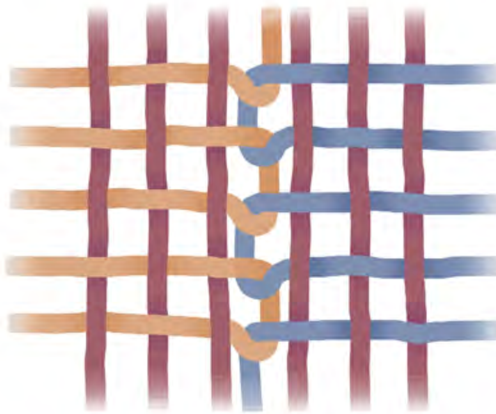
Without Interlock

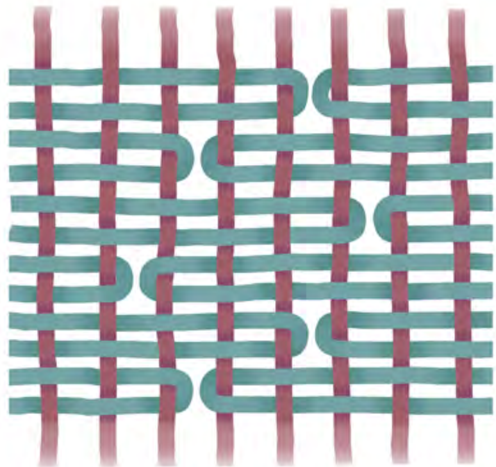
When there is no interlock used, weft threads meet in one shed (the term given to the gap through which weft threads are woven) and turn back in the next shed without interlocking with each other. This creates a small hole, the size of which depends on the thickness of the weft and how many wefts there are per centimetre. This method can be woven from the reverse or face side (see Figure 5).

Slit Tapestry

In tapestries, this technique refers to a method where the weft does not interlock (as described above). This is done several wefts after each other between the same warp threads, thereby creating a larger hole (a slit). Collingwood described this technique as follows: "The distinguishing feature of the vertical colour junction in slit tapestry is the absence of any interlocking of the two wefts involved" (Collingwood 1978, 169). The method most used to close the slit involves the weaver stitching the two edges of the slit together. This is done from the reverse side, after the weaving has been completed. This method is also used in carpets woven in weft ribs without pile and is then referred to as the Kelim Technique.







Figures 3–5: (Left) Reverse side. (Right) Face side. (Below) No Interlock. © Annelie Holmberg.

METHODS AND THEORIES

Which academic methods and theories can be employed when the topic of the research is a textile and the work made by weavers? The answer to this question must focus on the craft artefact and related craft skills. Therefore, an analysis of the craftsperson's competence, context, and personal choices is essential to ascertain an informed understanding of the object. In this analysis, it is important to state that my knowledge of weaving is a code competence. This knowledge is a foundation and is present in all parts of the research; it outlines research questions, choice of material, and theories. When, for instance, reading texts describing weaving or the organisation of a studio, my craft knowledge enables a specific understanding of this information.

Methods from the field of material culture have been used by several researchers working within Textile Studies (Candréus 2008; Aneer 2009; Dahrén 2010). Material culture is defined by Henry Glassie as:

> […] culture made material; it is the inner wit at work in the world. Beginning necessarily with things, but not ending with them, the study of material culture uses objects to approach human thought and action. (Glassie 1999, 41)

In the present chapter, artefacts are used in an analysis of the weavers' choices of methods, specifically how they have chosen to act and what the reasons behind their choices of actions are. Glassie suggests that artefacts can aid in telling a story when documents fail to do so; other times, artefacts can tell a story with the help of documents (ibid., 45–47). The use of interlocking, or other alternative methods for managing the meeting of two wefts, is not mentioned in any internal documents describing the work of the studio at Friends of Handicraft. Nor is it mentioned in literature about the studio. Choices concerning technique appear to be unimportant; they are either taken for granted or subordinated to the artistic expression. Additionally, the use of interlocking is not mentioned in personal work logs, business stories, or in registries of production. Written sources are therefore seldom useful for providing information about choices of methods or technique. They are useful, however, in relation to the context, which can tell us about the reasons behind particular choices and changes. Verbal sources, on the other hand, do provide us with information about methods and techniques. Craftsmen from the studios have given affirmative evidence about the changes to and use of interlocks. During this verbal communication, a study of the artefacts either preceded or was included during the discussion. Information from the artefacts themselves was therefore an important aspect of verbal communication.

The use or role of the artefacts as a source in research can vary amongst researchers in the same way that the perception of the necessary required knowledge can vary. McClung Flemming (1974) argues that the reading of artefacts, referred to as nonverbal documents, demands a form of literacy in the same way that the reading of a verbal or written source does. He claims: "In the case of the nonverbal document, he [the reader] must understand the vocabulary of material, construction, design, and function and how they are put together" (ibid., 160). Use of knowledge through craft (as a code competence) in an analysis is implemented by, for instance, Almevik (2014), Aneer (2015), and Rasmussen (2010). The methods Almevik uses to answer questions about the intentions of builders and the impact of inhabitants on an older house demands practical knowledge, thus enabling an analysis of traces made by tools and choices in construction. Aneer and Rasmussen both use costumes in their analysis. While Rasmussen claims that knowledge of craft shapes her research questions, both regard this knowledge as a foundation for their analysis. Knowledge in tailoring contributes with information about pattern construction and sewing, allowing the researchers to distinguish cultural and social settings in addition to periods in time. Aneer states that the foundation of this knowledge comes from one's own experience of craft, as well as from theoretical studies in the subject (Aneer 2015, 201).

Artefacts should be considered as a part, or a product, of their context. However, this context can be difficult to grasp as it is easy to notice the observable whilst overlooking the subtle. It is important to notice different aspects of the context as this can work to mediate different meanings the artefact may bear (Glassie 1999, 48). The context can, for instance, mediate use and circumstances for production, and grounds for these—all settings that can change the narrative of the artefact.

In this research, the historical craft traditions within the different studios and the studios themselves become the context for the textile artefacts. To enable the possibility to note variations within a context, Glassie suggests that the analyser uses categories "to envision context as a series of occasions belonging to three master classes—creation, communication, and consumption" (Glassie 1999, 48). In this chapter, I use these three categories in my analysis concerning the following research question: *How can knowledge of craft contribute* *towards a deeper understanding of a craft tradition?* 'Creation' refers to the making of artefacts and the choices made during the process, which could be considered as parts of the context. 'Creation' also consists of processes such as learning, teaching, cooperation, and memory. The category of 'communication,' with under-contexts of collaboration, donation, and commerce, focuses on the meanings that the artefact mediates—meanings that can be noted during the production stages, but which become fully apparent when the object is complete. These categories can sometimes be difficult to separate, which becomes particularly apparent with the last category stated by Glassie of 'consumption'. This category is directly affected by 'consumption,' as well as by 'creation,' by virtue of the producer's intentions affecting consumption. This means that the artefact's appearance, materials, and value are affected by all parts of the creation and this can change the outcome for consumption. Importantly, the category of 'consumption' also contains the use of the artefact—a use that can change with time and ownership (Glassie 1999, 48–58). It is therefore important to see the categories separately and in terms of how they intersect with one another.

The context of research is that within the studios and not the context of textile art during the twentieth century. Although changes within the expressions of textile art are relevant, the focus of this chapter is instead on the analysis of the tapestries from a perspective of craft. The studios whose choices in production are being analysed can be seen as closed places where a specific knowledge can develop and be preserved internally. The studios are to some extent aware of each other's existence and production, but cases of cooperation or exchange of personnel are almost non-existent. A tradition of being trained in-house, by a resident master, can be found in all of the studios. This kind of learning contains a formation of a professional identity that is created within a community of practice through non-formal tutoring and which is evaluated through (and during) practice (Nielsen and Kvale 2000). Communities of practice are thereby formulated and reformulated over the years within the studio. The practice can change (and be challenged), for instance, by an artist's specific expectations or external demands for change.

I apply the concept of *situated learning* in the analysis. Situated learning focuses on the teaching by a resident master, as described by Nielsen and Kvale (2000), though with an explicit emphasis on the community of practice and how an identity develops within this specific practice (Lave and Wenger 1991). When the non-formal, in-house learning takes place, the apprentice, according to Lave and Wenger (ibid.), more than observes and imitates. The observation and imitation "crucially involves *participation* as a way of learning—of both absorbing and being absorbed in—the 'culture of practice'" (ibid., 95). The participation is therefore essential to situated learning, a participation where the apprentice is an active part of the practice. The learning of the apprentices (or masters, since the learning is a continual process) is not only "work-driven" but is instead implemented by events in the everyday practice. This means that the learning is not always progressive; an essential understanding is gradually shaped and reshaped. Situated learning involves the whole person. A person's identity is affected by the implication of becoming a full participant and the right kind of person: "Thus identity, knowing, and social membership entail one other" (ibid., 53). In this chapter, the textile studios are seen as communities of practice and the learning within these communities is situated. Traditions and changes are consequently affected by this.

ANALYSIS OF METHODS AND MATERIALS

The following analysis of more than 50 artefacts has been carried out upon materials consisting of tapestries from the aforementioned studios: Friends of Handicraft, Alice Lund Textilier AB, Dovecot Studios, and Les Gobelins. To be able to place the present in a historical framework, the weavers' work has been related to the use of interlocking in the respective histories of each of the studios. The founding of Friends of Handicraft in 1874 is used as a starting point for the period of time addressed. All other studios mentioned here (except Les Gobelins) were founded at a later date.

Samples of tapestries and completed tapestries from the different studios have been studied, sometimes in archives and other times in galleries or during production. Verbal sources are also used to complement the analysis. To obtain these, I have visited the studios and interviewed the weavers, or persons responsible for the studios, about their use of interlocking. During these visits, my knowledge of weaving enabled me to ask questions and make observations from a weaver's perspective. I was a fellow weaver with a research perspective. Literature about both the general art of weaving tapestries and the particular studios has also been used. In the analysis, the weavers tend to be invisible. This is not with an intention to degrade the work carried out by the craftsperson. This is due to the fact that the interviews with weavers and embroiders at Friends of Handicraft were performed with an assurance of their anonymity in publications. Furthermore, samples and tapestries are not always labelled clearly with the weaver's name. Instead, it is the artist's name and a studio-mark which appears clearly.

The analysis of the artefacts (the tapestries and the samples of tapestries) performed below is inspired by the system advocated by, for instance, Prown (2001) and McClung Flemming (1974). Both propose a system where the focus is on identification of an artefact from a broader point of view, where cultural analysis and interpretation/deduction are parts of the analysis. Important in these methods, or models, introduced by Prown and McClung Flemming is that the questions or categories are used methodically in a qualitative and reflexive way, in accordance with aim, method, and material. Inspired by this I began with the basic information of the artefact and continued towards an interpretation or deduction of the artefact. The same questions were asked during the observation of all artefacts, and were not affected by production date/year, or if the production was still ongoing on a loom. When possible, both the reverse and face sides of the tapestries were observed. The questions asked were as follows: What weaving technique, warp, and weft material are used? What type of methods have been chosen when two wefts meet? Can the methods vary within the same tapestry? Can the artistic expression, material, and/or technique explain/affect the chosen methods? Do the chosen methods require work being done after the weaving? These questions were asked even though not all of the tapestries from the chosen period were analysed due to various accessibility circumstances, which affected, for instance, the selection of the tapestry and the ability to see the reverse side.

In the second phase of the analysis, Glassie's approach to contextual analysis, which considered the categories of creation, communication, and consumption, was applied. This was done with an aim to explain the use of different methods. By analysing sources describing the work carried out at all of the studios through these categories, similarities and differences were made visible. Sources included were literature, observations, verbal sources, and artefacts.

ANALYSING TEXTILES FROM A CRAFT PERSPECTIVE

The aim of this chapter is to provide an example of how knowledge of craft can contribute towards the analysis of a craft tradition. In this case, the particular knowledge is my own weaving education and work experience as a tapestry weaver, developed over the time I spent weaving within a community of practice. This knowledge and experience has given me the ability to notice particularities of weaving, such as the effects of choices of technique, the methods for creating shades of colour, the choices of material for warp and weft, and the use of different tools and their (possible) influence on the product. A concrete example of how craft knowledge contributes to an analysis undertaken by me, not a part of this study of interlocks, is when I observe the choice of warp material made by different studios. When I notice what kind of material the weavers have chosen, I know how that particular material feels in my hands. I can identify the different characteristics of materials, the spinning angle and how the weft is affected by this specific warp material. My competence leads to an understanding of how Dovecot Studios' use of a firm, round re-plying cotton yarn (in Swedish this is called fishnet twine) and Friends of Handicraft's use of several linen threads (often 16/2) taken together as one thread, each affect the weavers' work as well as the structure of the weave. These results lead to my understanding of why particular choices of material are made, why these choices are important, and how these choices have an effect upon the conditions for production. As a specific example of this, I can state that the warp used at Dovecot Studios is ideal for weaving weft reps while the use of several threads as one thread, as used at Friends of Handicraft, is helpful in the use of a visible coloured weft in a tabby. The knowledge of craft is also used in the analysis of documents from the studios and literature describing the context.

A product of my knowledge and experience is that the analysis has excluded the artistic aspect of the tapestry. The latter would be an analysis of textile art. I have mentioned this only when it is a relevant consequence on the weavers' work. I have instead chosen to see the art as objects and to maintain a focus on the textile craft techniques.

The analysis of process and the understandings had, are presented under three sub-headings below. The first two focus primarily on the artefacts while the last focuses on the context. Complementary sources—here, verbal and written sources—are used in an attempt to deepen the analysis of both the artefacts and the context. The two first parts are structured according to the use of methods for the meeting of wefts. The weavers' choices, within the different studios, are thereby linked to each other with an aim to show differences, similarities, and change.

CONSEQUENCES OF THE USE OF SLIT TECHNIQUE

The production of tapestries at Friends of Handicraft was probably initiated in the 1890s (Danielson 1991, 27). In the tapestries older than the 1950s examined from this studio, two kinds of methods were used when wefts meet. The most common was the method where wefts do not interlock, but instead weave back into the next row. The second method involves a double interlock and can be noted, for instance, in tapestries from the seventeenth century as well as in tapestries from the early years of the twentieth century. This method is used when the wefts meet between the same warp threads more than three to five times.

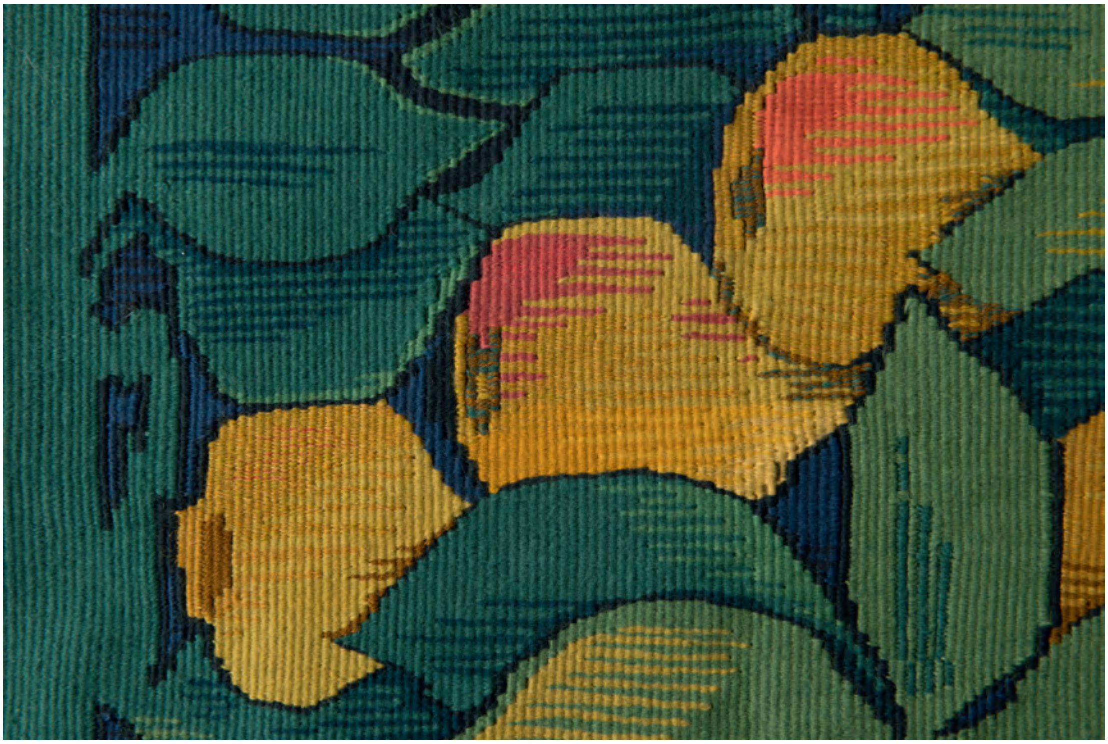


Figure 6: Face side of the sample from Friends of Handicraft, made in 1901 and composed by Maja Sjöström. The double interlock is used, but there is also an absence of interlock when the wefts meet in other areas of the tapestry. A smooth surface is created on the face side, and slits are visible in the edges of the green leaves. Photograph by Peter Segemark / Nordiska museet, Sweden.

Figure 7: (Next page) On the reverse side of the sample from Friends of Handicraft, the effect of the double interlock is visible as vertical lines shaped in two colours. Using this interlock made the practice of stitching slit unnecessary. Photograph by Peter Segemark / Nordiska museet, Sweden.

The double interlock can also be noted in tapestries produced at Les Gobelins in Paris. Representatives for Les Gobelins state that this method was introduced as a way to make the production more efficient, decreasing the need for further labour after a tapestry had been taken out of the loom. The necessity for stitching the slit no longer occurs when a slit is no longer formed due to the use of a double interlock (verbal source, Les Gobelins 2014). According to records at Friends of Handicraft made in 1902, the tapestry weaver Elin Öberg received a scholarship that enabled her to be present at Les Gobelins for two months (Årsberättelse 1902). There is a possibility, then, that Öberg learned the use of double interlocks at Les Gobelins, and implemented the method at Friends of Handicraft. With this in mind, it is important to state that the sample above (Figures 6 and 7) is said to be produced in 1901. This shows that the use of the double interlock was known within the studio at the time. Records confirm that the women in charge of the establishment, as well as some of the artists, weavers, and embroiders, travelled to France (for example) in the years around the end of the nineteenth century

and the beginning of the twentieth century (Danielson 1991, 105). This suggests that knowledge about craft methods could have been transformed in different ways and at numerous times as a result. At the same time, one must bear in mind that this kind of interlock is used in traditional Swedish Flamsk weaves. The knowledge of weaving Flamsk must have existed at Friends of Handicraft since these kinds of artefacts existed in their collection of textiles. Products made according to the Swedish textile tradition were also produced and sold, all in alignment with the aims of the establishment.

If the double interlock is a way to make the production more labour and cost efficient, my next question was to ask whether any other studios used it. Samples I studied at Dovecot Studios show that this method was also used by their weavers. Dovecot Studios were founded in 1912 and the weavers visited exhibitions and Les Gobelins in the 1920s (Cumming 2012, 15). It is possible that the weavers could observe tapestries from a technical point of view in Paris. At the same time, weavers at the studio in Scotland had former experience of tapestry weaving from the arts and crafts studio Morris &

Company, established in 1881 (ibid., 10). One can assume that the work at Morris & Company was carried out according to the traditional methods of tapestry weaving, since the work within the arts and crafts movement was always produced utilising historical methods (Todd 2004).

A change in the use of the double interlock can be noticed in tapestries and samples at both Friends of Handicraft and Dovecot Studios in the 1960s. The actions in both studios can be related to the fact that the weavers, from then on, wove with the face side towards the weaver (not, as previously, with the reverse). The change at Friends of Handicraft will be discussed in more detail below, since the studio chose a completely new approach. The change at Dovecot Studios was initiated by the artistic director Archie Brennan (Cumming 2012, 37). The double interlock is hard to weave when you have the face side upwards; it is not impossible, but through experience I know it is ineffective and difficult since the interlock is located on the reverse side. At Dovecot Studios the technique 'sew-as-you-weave' replaced the use of the double interlock. In this method, the weaver stitches the slit together during the weaving, with a needle threaded with a coloured thread, suited to the colours of the weave. Sometimes a thread of the same material as the weft was used and, other times, alternate materials were selected (verbal source, Dovecot Studios). This method has the same time-saving effect as the double interlock but can be done from the face side.

THE USE OF INTERLOCK—OR NOT—AT TWO SWEDISH STUDIOS

As mentioned previously, a change in the way of weaving tapestries occurred during the late 1960s at Friends of Handicraft's studio when the single interlock was introduced. An example of this is found in the tapestry Vi-We-Nous, created from a sketch by Siri Derkert in 1963, where the weaver did not use an interlock where the wefts meet. A change can be noted in samples of tapestries from the early 1970s. In these, the single interlock dominates. The change cannot be connected to the weaver. For instance, the weaver Ruth Larsson was part of the crew in the production of both the tapestry based on the sketch by Siri Derkert and several of the samples from the 1970s. Since the 1960s, the haute lisse loom, with a vertical warp, was replaced by a traditional loom with a horizontal warp, ordinarily used to produce fabric or carpets and with an upper construction for the changing of shafts. Therefore, the traditional tapestry loom, haute lisse, was out of use (verbal sources, Friends of Handicraft). Mathison (2011) regards the use of a traditional loom in the production of tapestries to be typically Scandinavian; documents and interviews indicate that the use is connected to a changed praxis at Friends of Handicraft rather than geography. The choice of loom does not show in the tapestries, though the choice of methods can sometimes change in accordance with the loom selected. In the analysis of the tapestries and samples, a change in the thickness of warp and weft can be seen to have occurred during this time. Warp and weft threads with lower rates per centimetre are also found today. These changes make the meetings of two wefts without interlock more visible than when there are more numerous wefts per centimetre.

At the same time as tapestries were being woven in the studio of Friends of Handicraft, tapestries were also woven at Alice Lund Textilier AB. Studies of samples of tapestries from this studio show that the most commonly used method is not to interlock the weft, but instead to turn it back in

Figure 8: Sample from the early 1980s woven at Alice Lund Textilier AB after a sketch made by Dagmar Lodén. Slits are used to amplify the lines. Photograph by Peter Segemark / Nordiska museet, Sweden.

the next shed. In some tapestries the holes which are created when the thick weft does not interlock are used as part of the expression. A line can be amplified by the holes in the weave (see Figure 8). Here, I'd like to point to the difference in analysis made from a craft knowledge perspective, as I believe my knowledge in the craft of weaving clearly affects this analysis. An analysis performed by an art historian, for example, might focus on the expression of the weave and how shadows are created within it, rather than on how a technical method together with the thickness of the weft creates an effect. During the 1970s–1990s, this studio and Friends of Handicraft often worked with the same artists. In these cases, tapestries and samples show that the use of methods cannot be related to the artist (Holmberg 2015). Choice of loom, thickness of warp/weft, number of warp/weft threads per centimetre, and the practice of weaving with the face side up are all shared between Friends of Handicraft and Alice Lund Textilier AB. Despite these similarities, my analysis reveals that the weavers used different methods when two wefts meet.

As stated earlier, neither the artistic expression nor the artist making the sketch seem to matter in the choice of method for interlock. Despite this, one has to note that the weavers at Alice Lund Textilier AB change their method when they make tapestries for the textile artist Helena Hernmarck. She favours a technique with floats on plain weave, and the use of the single interlock for the meeting of wefts (verbal source, Alice Lund Textilier AB). It is important to state that Hernmarck is educated in weaving and is a weaving textile artist, and is thereby more capable of discussing and evaluating technical methods within textiles than an artist without any textile education. Tapestries designed by this artist have formed a substantial part of production at the studio after 1975. This fact might change the weavers' future choice of method—something which will be revealed over time since this production is still ongoing. It is worth mentioning here that the single interlocks are mostly invisible in Hernmarck's tapestries since floats cover them; this can be interpreted as indicative of the choice of interlock being based more on technical characteristics than on artistic expression.

Regular cooperation with a specific artist has also occurred at Friends of Handicraft. An example of this is with the artist Lennart Rodhe, who, despite also sometimes collaborating with Alice Lund Textilier AB, produced various textiles at Friends of Handicraft's studio across roughly thirty years in the last half of the twentieth century. Rodhe was not an educated textile artist, as Hernmarck is. Nevertheless, he sometimes presented specific suggestions about weaving techniques. In one production, he wanted the weavers to use what he understood as traditional methods, such as hatching/hachure and the use of no interlocks (verbal source, Friends of Handicraft). By studying the technical methods in woven samples, I can confirm that the weavers made samples to convince Rodhe that the technique they usually used—single interlocks and dyeing colours instead of hatching/hachure—was as good as the suggestions that he made. The two tapestries produced by the weavers of Friends of Handicraft for Rodhe demonstrate that they used the methods traditionally used by their studio in the 1990s: single interlock and, instead of using hachures, they dyed the materials to achieve the necessary colours. Despite the artist's initial intentions, the studio's methods of production did not change—the studio's traditional method at the time was the weavers' choice.

THE CONTRIBUTION OF CONTEXT

An analysis of the above contextual circumstances has been undertaken with the use of Glassie's categories: creation, communication, and consumption. In the following part of the analysis, literature, verbal communications, and observations are the main sources—the starting points for this analysis are the understandings had in the analysis of the artefacts above.

The concept of 'creation' is connected to the choices the weavers make when they produce a tapestry. These choices are connected to the person as well as the community of practice within the different studios. According to the analysis of the artefacts, the weavers at the different studios and at different times have chosen different methods when it comes to conducting the meeting of two wefts. Nowhere in any of the studios' sites have I noticed written instructions or pictures about how this meeting should be done. According to verbal sources (Friends of Handicraft; Alice Lund Textilier AB), the learning mostly takes place during the production, even though the apprentices have weaving skills when they are hired. Both Les Gobelins and Friends of Handicraft have a school/education within their establishment; practice is thereby produced and reproduced—the learning is situated. Alice Lund Textilier AB and Dovecot Studios both hire individuals with external competence and then train them in-house. Through the learning tradition of masters and apprentices, knowledge is passed on from one generation of weavers to another. In interviews, the weavers and embroiders at Friends of Handicraft talked about who they learned their craft skills from, who they worked with over the years, and who made a specific impact upon their development. The weavers mention differences between different weavers' interpretation of colours and structure (from sketch to tapestry), which can be noticed in samples. At the same time, weaving technique and choices of methods are, overall, the same among the weavers. Even though the mentioned differences exist, the weavers have some room for individuality, although this room exists within common grounds which seem to be difficult to evade (verbal source, Friends of Handicraft).

When several weavers work together, they can learn craft skills which could potentially transform the practice. This learning appears to take place when it comes to the expression (for instance, through colour and structure) but not when it comes to technique and methods. To enable a change of technique and methods seems to require actions, which are connected to the concept of 'consumption'. The use of double interlock, single interlock, or 'sew-as-you-weave' can all be seen as methods to increase efficiency and to make the work required after the weaving less time consuming. Weavers at Friends of Handicraft claim that the artistic leader, Edna Martin (1951–1977), was responsible for the changes made in the methods of production. In the 1970s, for instance, Martin was responsible for the change of loom and the method to weave with the face side up (verbal source, Friends of Handicraft). It is important to state that she was also responsible for the establishment's economy, so the change may have been connected to thoughts about what was the most cost-efficient way to produce.

When it comes to 'communication' the tapestries are made with an intention to transfer a message, a feeling—an artistic expression. The colours, the composition, and the use of material are all chosen with an aim to create an artistic work. The choice of method for meetings of the wefts rarely affects the expression. The weavers can sometimes use slits to (for example) amplify lines; this can be seen in tapestries made at Alice Lund Textilier AB and Dovecot Studios. Double interlocks and the sewn slits can only be seen from the reverse; from the face side these methods are invisible and the expression is thereby unchanged by the use of these methods. The choice of thickness and density of the warp and weft affect the communication, which affects the tapestry's expression and might be grounds for the choice of methods of interlock. The weavers at Friends of Handicraft started to use a sparser weft and, indeed, abandoned weft ribs for a weft density which was closer to those found in a tabby during the 1970s (seen in samples at Friends of Handicraft). The use of a single interlock prevents visible holes from being formed in this new quality created at Friends of Handicraft. At the same time, Alice Lund Textilier AB produces tapestries of a similar quality, and does not use the single interlock.

To conclude, the expression communicated by the tapestry can be affected by technical solutions and methods. At the same time, when comparing the work of several studios, the analysis shows that the choice of technical solutions and methods can be connected to traditions or changes within the different studios rather than an aim for a specific expression. Practice and directives within the studio are shown to trump an adaption or change connected to the tapestry's expression.

The communication might be affected by the recipient of the communication and their competence in weaving. The artefact mediates meaning both during the production and once it is a complete object. The weavers are thereby recipients of the communication they themselves are creating—the artefact. The knowledge of weaving and the impact of different methods create a framework for the weavers' choices in performing the craft. The framework can be seen as part of the situated knowledge and affects what the tapestry is mediating since the choices are materialised. The weavers are an active part in the process, and choices of how to execute the meetings of the weft can have an effect. How distinct the effect is can depend on the thickness of the weft and the density of the warp.

As previously mentioned, the choice of method can be made on the basis of economy; in this way, the making of the tapestries can be analysed with respect to the concept of consumption. I must point out that the making of tapestries is a time-consuming craft, meaning that efficiency and profitability are words seldom mentioned in connection with this production. At the same time, the studios are all businesses with weavers as employed staff. Because of my own knowledge in weaving, I notice the use of interlocks, but the question is whether or not a potential buyer will do so too. This is not mentioned in any documentation or literature. Few of the verbal sources mention this. A likely conclusion is that the artistic expression and price are the decisive factors when it comes to consumption, not something so often invisible as an interlock.

The use of the tapestries has not been analysed. The customer's perspective is not part of any documentation, literature, or verbal source. Despite this, I can state that the different interlocks do not affect the function of the tapestry, thereby the use is not affected by the choices or changes of methods.

KNOWLEDGE THROUGH CRAFT AND ITS CONTRIBUTION TO THE ANALYSIS

Two research questions have been answered in this chapter. The leading question is: What kind of impact can knowledge through craft have on an analysis of a craft tradition? The more specific question in accordance to the focus of this chapter is: Can the analysis of the technical detail of interlocking demonstrate how a situated knowledge within a community of practice can be preserved or changed?

I study textiles through my knowledge of weaving—a knowledge that consists of a deep understanding of materials, tools, techniques, quality of textile materials, and production within a community of practice. This gives me an ability to see technical details and relate these to aspects of manufacturing and textile craft traditions. My experience as a researcher in the subject of Textile Studies, which has a focus on textile craft and textile artefacts, shapes the way research aims, material, methods, and theories are selected. At the same time as presenting an argument on the impact that a knowledge through craft can have upon an analysis, it is important to state that this (my) knowledge can also function as a restriction. It comes with a specific terminology and is easily influenced by where and when it is learned. Such knowledge is thereby at risk of being exclusive and subjective. This circumstance indicates the importance of using complementary sources and of taking an objective approach to the premises of one's knowledge and methodology so that the research does not become exclusive or restrictive.

Can you claim to notice changes within a craft tradition through such a detail as the use of, or absence of, interlocks? The choice of method for the meeting of two wefts can appear as a small detail—and in some ways it is—but despite this, my analysis above shows that this detail is affected by changes within the studios. The changes differ between the studios, despite a joint tradition connected to the traditional weaving of tapestries. When the respective leaders of the studios at Dovecot Studios and Friends of Handicraft made changes concerning the side of the weave facing the weaver, this probably changed the use of method for interlocks. The weavers' way of performing part of their craft was thereby transformed, and the community of practice was changed. Several years after this change, the 'new' methods were used to such an extent that some weavers expressed that use of another method is, if not impossible, certainly not preferred (verbal sources, Dovecot Studios and Friends of Handicraft). The learning of new weavers is situated within a studio context and is thereby taught according to the practices used in that establishment.

The context shows use of different tools and variations of warp density and thickness of wefts among the studios. These are changes and differences which are difficult to notice without knowledge of weaving. If you have the knowledge, it gives you an opportunity not only to notice these features but also to understand that they can have an impact on the weavers' choices of methods and other issues that affect the design process or economy of the studio. I know what causes difficulty when weaving, what effects a sparse or thick warp will have on the wefts, and thereby whether aspects of craft have affected the production over time. This verifies an impact of knowledge through craft in an analysis. My knowledge of weaving, through professional practice as a weaver at a studio and my education, is embodied and persistently present in every analysis of textiles, interviews and written sources that I undertake.

CONCLUSION

To conclude, a practitioner's perspective contributes immensely to the analysis of artefacts, written sources, interviews, and observations. When this knowledge is employed, it opens up new possibilities for different questions to be asked than have been asked by other researchers. Without this (my) specific knowledge, the questions—and answers—would be different. An example of this are questions like the following, used in the analysis: Can the artistic expression, material, and/or technique explain/affect the chosen methods? The answer is that the artistic expression, material, and/or technique sometimes affect the choice of methods, but the choice is also affected by traditions and aspirations within a studio and the studio's staff. This answer is dependent on my knowledge of weaving: I see the difference between using a hole, created by using no interlock, as an artistic expression or an effect of the method. I can follow the use of material in the written sources and understand how this affects the craft, how it can be part of a tradition. The textile material culture and community of practice can contribute with answers otherwise unseen, answers that give clues about the context. Questions about how craftspeople have performed their work will offer a deeper (initiated) understanding, for instance, of the use of technical methods and their effects. Thus, skills, tradition, and the learning of craft will be visualised in a qualitative result and the importance of the craftspeople's work and working conditions can be seen. The methodological analysis of various sources of material and the ambition to conduct a profound reasoning establishes this as a qualitative scientific analysis.

The result of the analysis in this chapter confirms knowledge of craft to be useful as a tool in a qualitative scientific analysis. For researchers and students of Textile Studies at Uppsala University, this is a core issue. As an interdisciplinary subject the use of a craft perspective (and knowledge of craft) can be both an opportunity and a problem—all depending on the acceptance of the perspective by other subjects. From my point of view, the labelling or the categorisation of knowledge is not important. What *is* important is that all kinds of knowledge are respected as being equally important and valuable in an analysis, provided there is a profundity of the knowledge in question. Consequently, I state the importance of verbalising these analyses, enabling acceptance and new research collaborations, which will generate new knowledge within the field of textiles about both the present and the past.

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Samples at Friends of Handicraft, Stockholm, Sweden.

Samples from Friends of Handicrafts collection (samples made from 1874 until the 1950s), Nordic Museum, Julita, Sweden.

Textiles under production and exhibition at La Manufacture des Goblins, Paris, France, and Dovecot Studios, Edinburgh, Great Britain.

VERBAL SOURCES

Alice Lund Textilier AB, Frida Lindberg, June 2018.

Dovecot Studios, Naomi Robertson 2014; Naomi Robertson and Rudi Richardson 2019.

Friends of Handicraft 2012–2014, interviews with active and former weavers and/or embroiders.

Les Gobelins 2014 (meeting and guided tour with representatives from the studio, discussion with weavers).

ENDNOTE

1. This technique is named inslagsrips in Swedish. According to Geijer and Hoffman (1979), the English name is weft ribbed fabric. At the same time, Albers (2017) names the technique weft or long ribs. I have chosen to use Albers's term: weft ribs. Collingwood (1978) uses the term weftface (in contrast to the term warpface) and thereby shows which system of threads is most visible.

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KEYWORDS: Boat building, craft tradition, documentation, interpretation, reconstruction.

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Interpretation of Boats in a Craft Tradition: How the Craftsperson's Perspective Can Improve the Interpretations of Artefacts in Research

By Fredrik Leijonhufvud

INTRODUCTION

In my work as a teacher of boat building, documentation and reconstructions of old boats have been a vital part of my work. Working within the tradition of boat building, the teaching is about safeguarding traditional boat-building skills as an intangible heritage, but also a focus on the tangible heritage of boats. In recent documentation projects I have tried to improve the documentation practice and I have come to the conclusion that a perspective from a boatbuilder, a person with hands-on skills and experience of building boats, will have valuable contributions to the technical and cultural interpretations in historical research of boats.

This chapter focuses on three concepts and the relation between these concepts. The first two concepts are *craft tradition* and the recording and interpretation of artefacts, here called *documentation.* The third concept is a combination of two concepts: *Craftsperson-Researcher*—that is, a craftsperson performing research. The concepts of tradition and documentation are both of importance in the field of craft sciences but they often represent different approaches. The ideal of the tradition concept in craft is an unbroken, local, master-apprentice situation in contrast to craft skills reconstructed from interpretation of artefacts (documentation). The concept of the *craftsperson-researcher* is, in itself, problematic, where most people would intuitively connect the concepts of craftsperson-tradition and researcher-documentation. There is still a need to analyse how contemporary craft traditions can be used in the interpretation of old artefacts and how old artefacts can have an impact on contemporary traditions or even in the reconstruction of lost craft skills. In the following text I will show that there are reasons to argue that the perspective, skills, and knowledge of the *craftsperson-researcher* can improve the quality of these interpretations and reconstructions.

Figure 1: A clinker-built boat, where the planks overlap and are riveted together with copper rivets. Local types of wood are used, and the boat builder will hand-pick grown bends and high-quality wood. Photograph by Rikard Plog.

THE CONCEPT OF CRAFT TRADITION

The clinker boat tradition is a technique in which relatively thin planks are fastened to a backbone of keel and stems. The planks overlap and are fastened together, often with metal rivets or treenails. The eye of the boat builder is used to govern the shape of the boat. The ribs are inserted into the shell to stabilise it. I have been teaching the Nordic clinker boat tradition, especially the Swedish boat-building tradition. With a narrower, local perspective on craft tradition, one can question the very existence of a common Nordic clinker boat tradition. Still, it is well known that the boat-building traditions in the Nordic countries show common features and a common origin from the boats of the Bronze and Viking ages (Eskeröd 1970; Hasslöf 1988; Dhoop and Olaberria 2015). This also includes Iceland, the Faroe Islands, and Shetland. The Nordic boat-building tradition encompasses a lot of different boat types, but it is still possible for someone within this tradition to define what falls within the Nordic tradition or not. The local boat-building traditions can be categorised as local variations of a common Nordic tradition descended from the Vikings. On 24 March 2020, Sweden, together with the other Nordic countries, nominated Nordic clinker boat traditions to UNESCO's representative list of the intangible cultural heritage of humanity (Swedish National Commission for UNESCO, 2020).

Traditions have a limited geographic extension in contrast to the transboundary of modern society. The Nordic clinker boat tradition becomes transboundary and the geographical limits are stretched when a boat from another Nordic country is replicated in the boat yard of the school where I work. There are many local boat-building traditions in the Nordic area with specific knowledge that we cannot fully replicate in our school boat yard. A boat-building tradition can be narrowed down to one specific boat type in one specific place.

Planke (2001) provides an interesting analysis of the concept of craft tradition. He studies two local Norwegian boat-building traditions: the Sogne boat and the Oselvar boat. Planke's definition of tradition is a systematic knowledge transfer—a continuous social process for the transfer of certain knowledge (ibid., 313–27). Planke's theoretical framework of the tradition concept originates from Rolf (1991). In Rolf's definition of tradition there must be at least three generations, with the second generation transferring the knowledge from the older generation to the new generation. The generations do not have to be biological; in a learning situation for PhD students, a new generation can be added within five years (ibid., 148).

According to Planke, a tradition is a fairly linear system but there is also room for change. Knowledge can be refined and developed within the tradition. Planke states that: "As long as the new generation's knowledge development and interpretation activity take place within the tradition and with their masters as examples, it is only an adaptation and adjustment of the tradition" (1991, 333, my translation). I think that the problem is to establish a consensus of what we mean by *within the tradition*. Planke claims that only the tradition bearers can define what is within the tradition; it cannot be defined from the outside (ibid., 337–38). With this definition of a tradition's boundary it is easy to examine whether something is within the tradition or not, but there are obvious logical problems with this definition as the tradition bearers then, in a circular manner, must define themselves as being a part of the tradition.

The nature of traditions is also discussed by Almevik (2014). He finds that tradition is rarely static as it is recreated and adapted by new generations. Almevik raises the question of the extent to which the inner logic of a tradition can change without causing a collapse or break of the tradition. Like Planke, Almevik claims that it is only the tradition bearers who can define how much change is possible within the tradition (ibid., 10). Almevik also addresses the fact that there are craft traditions that have been reconstructed to meet the demand of building conservation (ibid., 12–13).

It is tempting to romanticise and depict traditional boat building as an unbroken tradition of intangible heritage where knowledge and skills are handed over from master to apprentice. There is, of course, a theoretical possibility that a master will transfer all of his or her knowledge to the apprentice. In practice, however, the apprentice never becomes an exact copy of the master. The new craftsperson develops his or her own skills and personal style.

Influences from other masters and from other geographic areas influence the apprentice, as well as impressions from existing artefacts and tools produced and used in the past. From this point of view a craft tradition must be defined as a process. The craftspeople are the actors that uphold this process. The boat-building tradition is a slow-changing process, where tradition can develop, pick up elements from other craft traditions, and possibly even regain knowledge stored in material artefacts from the past.

Rolf (1991, 148–50) presents the idea that there is a distinction between strong and weak traditions, where the strong traditions have a social structure that controls the knowledge transfer from generation to generation, like a guild. Rolf's division into strong and weak traditions does not really focus on the tradition's strength when it comes to being resilient to changes in the umwelt, the surrounding society. These changes can occur due to technical development or a reduction in the demand of the produced products.

I would like to suggest a slightly different approach to the definition of craft traditions as strong or weak. I claim that a craft tradition is strong when it influences other craft traditions and is not in need of change; it is strong when it can be considered to have reached a (temporary) perfection and the demand of the produced artefact is high. In contrast to Rolf, I claim that the distinction between strong and weak craft traditions is not all about social structure of the knowledge transfer. An example of a strong boat-building tradition was the local tradition of building Oselvar boats in the late nineteenth and early twentieth centuries (Planke 2001, 143–54). In comparison to boat-building traditions of the Stockholm archipelago in the same era, the social structure of the craft tradition was similar, but the Oselvar tradition proved to be strong while the Stockholm archipelago tradition was weaker and less resilient to technical development. The Oselvar boats were built in the Norwegian parish Os but were also demanded by and sold to other areas including Sweden, thereby also influencing other boat-building traditions. The boat type was very successful throughout this era and there was no need for major changes within this craft tradition. The changes that were made were minor and mainly aimed to make the production a little more efficient. In a strong tradition such as this, where there is no need for change, the knowledge transfer is consequently almost linear. This strong tradition does not need to experiment with changes in shape, and there is no need to imitate artefacts from the past or from other regions when the demand of the existing craft is quite sufficient. In the latter half of the twentieth century, the demand for Oselvar boats decreased and the boat builders became older and fewer in number. The tradition was no longer as strong as it used to be, and the situation of business rivalry changed. In the days when the tradition was strong, the exchange of knowledge between the different boat-building families was restricted to keep the advantages of traded skills within the family, but when the tradition became weaker the masters became less restrictive in sharing their knowledge with others. It is a reasonable claim that a tradition which is strong in terms of high demand and temporary perfection is a fairly linear system in comparison to a weak tradition. When a craft tradition is weakened, those who practise the craft need to adapt in order to meet new demands or develop their products. These adaptations can be influenced by other regional traditions or by studies of past traditions. While the study of artefacts from the past and from other regions does not influence strong traditions significantly, it is a possible way to revitalise or develop a weak craft tradition. Another logical consequence is that strong traditions, in this notion, influence weaker traditions.

Figure 2: Documentation of a boat using traditional methods which use a plumb line and a tape measure. Photograph by Fredrik Leijonhufvud.

DOCUMENTATION OF BOATS

The boats that are subject to documentation are often kept in places where the long-term preservation of the boats is endangered. The purpose of the documentation work is to safeguard the information that the boat can reveal. This can include information about the boat's shape and technical properties, but also about the building process, the use of the boat, and its local and historical context. An artefact—in this case a boat—contains information about craft traditions and other aspects of past cultures. The documentation aims to preserve knowledge and skills that can be used in the future for reconstruction of building processes, and, of course, the physical reconstruction of the boat. There have been attempts to create manuals for documentation of boats (Anderson 1988; Kentley, Stephens and Heighton 2007) but they lack the modern digital methods to 3D-scan the boat, and these methods impact on the documentation process. The manuals also tend to focus on the technical properties of the boat and not on the experience and context. Some of the manuals focus on documentation for reconstruction, and some focus on restoration. Creating fixed routines, guidelines, and pro forma documents can have an agency on the process of recording (Yarrow 2008). This should be taken into consideration in all routines of documentation. In Yarrow's example, he focuses on how archaeological context sheets influence the outcome of the documentation of sites (ibid., 130–32).

Traditional measuring methods without modern 3D technology are typically performed with pen, paper, plumb line, and tape measure (Figure 2). The sketches and measures taken in the fieldwork are used to produce the drawings. The technical drawing of the hull's shape is referred to as a lines plan. The traditional measuring methods also include photography and written notes on dimensions, fastenings, wood species, and other properties.

The concept of *forensic conservation* was introduced by Weaver (1995) and the *forensic perspective* on documentation has been used by Almevik in his analysis of buildings as a source of knowledge (2012). The forensic perspective is a way to acquire as much information as possible from an object, using a palette of methods and perspectives in parallel. As the name implies, the perspective examines a place or an artefact, and attempts to find information about the artefact but also attempts to acquire a deeper understanding of why the object is in its present state. A forensic perspective can be used to trace changes and create a timeline of changes (Almevik 2012, 309). In my documentation of boats, I have tried to apply the forensic perspective, using different methods and perspectives. Some of the methods I have used will be presented in the following text.

In recent documentations, I have used digital photogrammetry as one of the methods within the forensic perspective. Digital photogrammetry, or structure-from-motion, is a method for recording the measurements and geometry of an object using a number of photographs of the object. The 2D images are processed by computers to generate a digital 3D model. The photogrammetry process starts with photographing the boat, before the photographs are exported to a photogrammetry software to create the 3D model (Leijonhufvud 2019).

In using photogrammetry in documentation projects, I have found that even if the recording of the boat's shape can be done in a very efficient manner using digital technology, it is still valuable to spend time with the artefact and gradually get to know it (Leijonhufvud 2019). The effects and consequences of how much time you spend and how you observe the artefact have been described by Bresler in relation to experiencing and studying art. She emphasises, above all, learning how to structure and organise her thinking and making sure it is concentrated over a long period of time (Bresler 2006). When you approach a boat you often have to tidy up and remove things that are obstacles to the documentation work. Sometimes you even have to reassemble a boat that has disintegrated, or straighten up a hull that has lost some of its shape. I have found that these processes, involving tactile contact with the boat, are very helpful for revealing specific details of the boat or making new interpretations.

Beyond all of the measured data, the character of the boat must also be studied. The character is a description of the entire artefact, an indication of the dominant properties as they are experienced by the researcher (Almevik 2012, 65). The character of the artefact must not be lost in the documentation process. Almevik suggests that parts of the documentation could have the format of a report which incorporates these impressions and expressions of the artefact's character (ibid., 75). In my own documentation practice, I have tested the creation and use of a digital questionnaire with a mix of multiple-choice answers and free-form text fields, to encourage the reportage format. An example of such a question is: *What is your first impression of the boat and the place where the documentation is performed?* Another method that proved to be good is the use of video to record short documentation stories (Figure 3). My experience is that the video recording helps me to achieve an awareness in the documentation. With awareness I mean that when I recount the documentation in words it becomes clearer and more obvious to me what I am doing and why I reach certain conclusions. The short video story works like a notebook of the documentation with focus on details of the artefact and explicit comments on the documentation process, experiences, and interpretations. Molander stresses the importance of awareness in a learning situation (1996 257). He claims that in the process of gaining *knowledge-in-action* you have to use *awareness-in-action* (1996, 237–43). When recording a short

Figure 3: Example of documentation video reportage. Click the image to see the video if reading a pdf version, scan the code to the right or go to: https://youtu.be/ODTD_5p9HtY to reach the video. The audio is in Swedish, but there is a written summary in English if you follow the video link. Video and photograph by Fredrik Leijonhufvud.

video story of the documentation, I have to focus my awareness on the things that I have found particularly interesting and new interpretations that I have made.

Performing a documentation is an act that interferes with the artefact. This interference can be physical, for example where a boat is so disintegrated that it needs to be reassembled to record the boat's shape. An alternative approach could be to leave the boat in its disintegrated state, but then the documentation does not say much about the boat's shape and information about the boat's prime function is consequently lost. Considerations about physical interventions of buildings, monuments, and art and historical artefacts have been central to the field of conservation since it was established (Muñoz Viñas 2005; Jokilehto 2007; Richmond and Bracker 2009). The documentation of an artefact can be very gentle in a physical sense, and photogrammetry is an example of a method that can be very cautious. In many cases, photogrammetric measuring can be performed without touching or moving the artefact. But even if there is no physical interference, the artefact will be affected by the documentation. Gartski (2017) is aware of this effect and gives the example that 3D models generated from the original are not the same as the original artefact; they are additions to the narratives of the original artefact. According to Gartski, these narratives can affect the original aura of the artefact as they become additions to it.

THE CRAFTSPERSON-RESEARCHER

In the following section I will share an example of how craftspeople interpret artefacts in contrast to people who are unfamiliar with the craft tradition in question. I was mentoring a group of boat-building students through the documentation of a boat from the nineteenth century. Bypassing visitors of the open-air museum where the boat was displayed showed little or no interest in this decayed wreck. We studied the boat thoroughly and I guided the students with my knowledge as a boat builder. By pointing out specific details, such as hewed planking, natural grown knees, and many other details, the students could gradually observe the boat from a new perspective and together we were impressed by the skills of the boat's builder. The students were surprised to find that they gradually perceived the boat in a totally different way than when they had first approached it. This particular boat had certain elements that are rare or even extinct in the local boat-building tradition. For a boat builder of a related tradition in which there are many similarities to the tradition in which the observed boat was built, it is still possible to interpret these elements, record them, and reproduce them. But for people that were unfamiliar with the boat building tradition, like the bypassing tourists, the boat was obviously quite mediocre. The boat-building students had some knowledge in similar craft traditions and could learn from the boat with some guidance. After our session, the bypassing tourists still interpreted the boat as a mediocre, decayed wreck, not impressing them in size or appearance. The boat building students, on the other hand, had changed their own interpretations of the boat with the help of their teacher's boat-building knowledge. When I asked the students which of the boats in the museum they liked the most, some of them had changed opinions during the excursion; with gained knowledge, they became aware of certain qualities and were able to see and interpret relevant details.

Practical boat-building skills are not necessary in performing a basic recording of a boat's shape. A boat designer or, indeed, anyone could record the basic shape with good instructions and some practice. The part where a boat builder is really needed is in the interpretation of construction details and the interpretation of the shape. However, in the documentation of boats, it is desirable to use as many applicable skills as possible. Boat-building skills are vital to interpret the boat, but sailing skills are also necessary to understand how the boat's shape interacts with the surrounding water. Academic research skills may be needed too.

Documentation of boats and other artefacts produced by skilled craftspeople must not be performed without consideration of the skills used to produce these artefacts. When it comes to the study of skills, Ingold (2011) promotes that the research should be performed with a first-person perspective by a craftsperson. "The study of skill demands a perspective which situates the practitioner, right from the start, in a context of active engagement with the constituents of his or her surroundings. I call this the 'dwelling perspective'" (Ingold 2011, 5).

Norwegian craftsperson and scholar Godal has carried out comprehensive studies of traditional craft, including boat building and carpentry. When presenting results from a study of boats and boat builders in Nordmøre (Godal 1995), he advises the researcher to approach the field of study with an open mind, without preconceived notions or hypotheses, using an inductive research method. On the other hand, he also thinks that the researcher has to learn the craft to a fairly advanced level in order to be able to understand it. Combining these two approaches in the research can be difficult as an understanding of the craft per se leads to preconceived notions (Durling and Niedderer 2007; Seiler in this anthology; Westerlund in this anthology). For Godal's method of research to be rigorous, the craftsperson/researcher has to be aware of, and stress, his/her subjectivity. At the same time, one of the advantages of being a craftsperson and carrying out research on one's own craft is that the researcher is in direct contact with the field of study.

All archaeological research shows that physical artefacts can be sources of knowledge, but to what extent can a boat be a source of past craft knowledge, and can this knowledge be situated within a tradition? In an article by Godal (1996), he focuses on how artefacts can be interpreted even if there are no tradition bearers still alive that have the answer to the interpretation. The case studies in Godal's (1996) article describe the interpretation of different types of oars. Godal claims that artefacts contain lots of information, but to be able to interpret this information well, one must be able to ask the right questions of the artefact. The ability to ask these questions requires the researcher to have two kinds of knowledge: theoretical insights and practical experience. The theoretical insights relate not only to academic knowledge but also to theory within the craft, including methods, material, and design. A person that has spent a lot of time rowing or making oars is better suited to interpreting and revealing the knowledge of an oar, for example (ibid., 55). Godal uses the concept *handlingsburen kunskap* (action-based knowledge), which requires live knowledge transfer and, therefore, tradition bearers. A person with theoretical insights does not necessarily know how to row a boat and a person with practical experience does not require the knowledge of wood cellular structure, mechanical principles, or physiology (ibid., 56). Godal's conclusion is that an artefact like an oar can be best interpreted by a person with both theoretical insights and practical experience; an artefact created by a craftsperson bears the heritage of the craftsperson and the culture in which the person lived (ibid., 59).

My interpretation of Godal's ideas is that a person can be suited to interpret an artefact from a craft perspective if the person has relevant theoretical insights and practical experience from craft traditions that are closely related to the local tradition from which the artefact originates. The researcher does not have to be a tradition bearer of an identical tradition to be able to ask the right questions of the artefact.

In my work as a boat builder, recording and building replicas of boats, I often find boats from local variations of the Nordic boat-building tradition where there are no longer any boat builders alive who carry the practical experience and knowledge of how these particular boats were built. According to Godal's conclusions, we can still interpret knowledge from these boats if we have knowledge and experience of related traditional boat building and the handling of traditional boats. A good method is to gather a group of boat builders, all with knowledge of building similar boats, and discuss the interpretation of the boat collectively on site. Another option is to work from an interdisciplinary approach with a group of experts from different fields of expertise, such as archaeology, conservation, craft, art, design, and natural science. Good examples can be found in Botwid (this anthology) and Paasche (2010). Paasche performs an archaeological analysis of the Tune ship in cooperation with boat builders and other experts.

An example of a craftsperson's interpretation of an artefact is illustrated in Figure 4. The picture

Figure 4: This grown knee can reveal how another part of the boat has been repaired. Photograph by Fredrik Leijonhufvud.

shows details of a nineteenth-century boat. In the marked area there is a grown oak knee made from a natural bend in a tree.

To make an interpretation of this knee, as a part that has been attached to a thwart that is now missing, requires some basic understanding of traditional boat construction. A boat-building student, a marine archaeologist, or a person with experience of using similar boats would most probably comprehend the fact that a thwart is missing here. To understand why the grown knee is cut flat on the top is a bit more difficult; knowledge of similar boat-building and restoration processes is helpful for this interpretation. The grown knee on the other side of this boat is missing, so it is impossible to see whether it had the same flat top. In most cases, a flat surface would indicate that there has been another piece of wood fitted on top of the knee, but that is not the case here. From a boat builder's perspective, it is possible to reveal the fact that this has not originally been cut flat, but has been cut in a later restoration of the boat when a piece of the outside gunwale (the upper edge of the boat, not visible in this picture) has been replaced. This replacement of the gunwale is also confirmed by the fact that there is a set of old nail holes near the existing nails, close to the top of the planking. One of these nail holes is situated directly above the grown knee. For the craftsperson replacing this part of the gunwale, it was impossible to loosen this riveted nail that was hidden beneath the grown knee. An easy way to access the nail was to cut off the top of the knee leaving it with a flat top after the restoration work. A person without the necessary boat-building experience would probably not be able to make these conclusions alone—a craftsperson is needed to reveal this. This detail of the boat also indicates that the boat has been chafed from use and was considered to be worth the effort of restoration, even though the chafed piece of wood no longer exists. Interpretation of several details in this manner adds information to the interpretation and understanding of the whole boat.

DOCUMENTATION OF ARTEFACTS TO UNDERSTAND OR RECONSTRUCT TRADITION

When the tradition is broken, we can hardly define it as a tradition anymore. Regardless of whether we call it craft tradition or not, there are historical evidences proving that people in ancient cultures studied artefacts to gain knowledge from the past (Kelly-Buccellati 2012). The concept of the *time-gap apprenticeship* (ibid.) is a knowledge transfer without the assistance of living tradition bearers, where artefacts themselves have been used to revive an extinct craft. Kelly-Buccellati's examples are from Mesopotamian ceramics. She writes that: "Time gap apprenticeship is not a transfer of knowledge from one generation to the next but rather an acquisition of that knowledge by a later craftsperson based on earlier examples" (ibid., 210). The artisans in Kelly-Buccellati's study have not just studied artefacts from past masters and copied them; they have shared the same basic skills and knowledge of craft with their ancestors. From these skills, they have been able to revitalise production of artefacts in the contemporary craft tradition that shares similarities with the skills of their ancestors. For a craft person to be able to interpret artefacts in this way, both the explicit and implicit information from the study of the artefact must be deciphered (ibid., 212). Kelly-Buccellati's conclusion is that even though we do not know how the apprenticeship system worked in ancient Mesopotamia, it is obvious that artefacts made by their ancestors served as sources of knowledge. The interest in the craft traditions of past times indicates an appreciation of values that were shared over a long time (ibid., 221).

According to Godal (1996), the person who performs the interpretation has to have both theoretical insights and practical experience. Trying to position myself in Godal's theory, my theoretical insights include historical knowledge about boat types and their geographical spread; knowledge of the physical properties of wood; and knowledge of hydrodynamics. My practical experience is my experience building and using boats. The theoretical insights and practical experience that I have achieved are not exactly the same as in the tradition in which the boat was built, but there are enough similarities to enhance the interpretation of the artefact.

A similar idea is presented by Rolf, that an artefact can itself work as a tradition bearer, but only if its cultural significance is preserved, meaning that there are still people in the society who have the knowledge needed to understand the artefacts (1991, 141–42). In my case, I think that much of the cultural significance of a boat is preserved, meaning that a boat builder is able to interpret and learn a lot from it, even though the master who built the boat is gone.

To be able to reach a good interpretation of a boat built in an older tradition and by a boat builder with a unique set of skills, experiences, and understanding, you have to be aware of your own tradition. Without the awareness of your own craft tradition and its impact on the interpretation of the artefact, there is a risk that the interpretation is incorrect. This awareness of today's traditional craft prejudice in reconstruction of craft is analysed by Seiler (2020) and Melin (2017). They both agree that craft skill of today is useful for interpreting the past, but stress the importance of the craftsperson-researcher deconstructing their own contemporary prejudice of craft in order to understand historical craft (Melin 2017; Seiler 2020, and in this anthology).

In my career, I have also seen examples of misinterpretations when old boats have been do-

Figure 5 A–F: Two nineteenth-century boats from the Stockholm archipelago, interpreted in reconstructions, but lacking the characteristic shape of the stem. A–B show the original boats, C–D show the line plans from the documentations. E–F show the replicas.
Images by Fredrik Leijonhufvud.

cumented and copied, but also slightly adapted to aesthetic values of contemporary boat-building traditions. Fairing the lines and curves of a boat is a central skill of boat building. Fairness in a boat means that the curves of the boat are smooth. When I documented nineteenth-century boats from the Stockholm archipelago using digital photogrammetry, the 3D model showed that the curve of the stem had an unfairness that earlier documentations and reconstructions had made fair and smooth (Figure 5). The computer and software that generated the model do not have any preconceived ideas of the aesthetics of contemporary boat traditions and so they are able to generate a true 3D model from the collected data without such interpretation. This can also be a problem as the computer lacks common sense and can thus allow, or even create, mistakes that are obvious to a human being.

Studying a similar boat from the same area and era showed that this boat also had the same detail in the stem curve that had been ignored in yet another documentation. Replicas have been built of these two boats—very beautiful replicas I would say—but they lack the characteristic shape of the stem that seems to be an intentional aspect of the boat's original craft tradition. It is difficult and maybe even impossible to imagine and understand the craftsperson from the past, but that is still what we try to reach when we document artefacts in order to reconstruct knowledge and skills. A good practice for documentation is to trust the artefacts and reflect on how your personal tradition, experiences, and prior understanding all affect the interpretation. This is also the experience of Planke's reconstruction of a boat from archaeological fragments (2011). Planke explains how the interpretation and reconstruction can reach various results depending on perspectives and contemporary traditional ideas on how a boat should look and what a traditional boat is if we do not strictly follow the artefacts and their narrative.

In some cases, the traditional craft can harmonise better with the modern digital documentation than with some of the manual measuring methods. The boat builder's abstraction of the boat, and the creative process in which the boat builder creates a boat, is one distinct dividing line between the traditional boat building of past times and the modern boat building in wood. Like a sculptor, the traditional boat builder creates the boat freehand from certain styles and according to the customer's demands. Tempte's description of a particular boat builder, who had an image of the whole of the boat in his mind during his building process, is a very accurate representation of what the traditional boat builders' abstraction is about (Tempte 1982, 87). In today's modern boat-building process there is a gap between the boat designer and the boat builder. In my role as a teacher, I have found that many boat-building students have problems reading the boat plans and visualising the shape of the boat as specified in the 2D plans. The use of digital 3D models could possibly bridge this gap between the designer's plans and the boat builder's abstraction (Figure 6). A digital 3D model could actually help the boat builder to regain the past master boat builder's sense of control and to gain a better overview of the boat's geometry. In that way, a digital 3D model could be better suited for knowledge transfer of traditional boat-building abstractions than a conventional lines plan. Based on these premises, a digital documentation could be well suited for reconstruction of boat-building traditions.

Documentation often has a tendency to academize the craft tradition and neglect the craft processes and skills. The process of documentation

Figure 6: A 3D model of a nineteenth-century boat from the Stockholm archipelago. Click the image to see the video if reading a pdf version, scan the code to the right or go to: https://skfb.ly/6TLWV. Model by Fredrik Leijonhufvud.

puts the artefact in a new context that is hardly the one it was originally intended for. From being products of a vital, locally based tradition without boat plans, they become part of an academic context of theoretical analysis and digital media. In the attempt to safeguard cultural heritage, it becomes a paradox that the documented boats risk losing some of their original authenticity when they are subject to 3D modelling, blueprints, and descriptive texts. An awareness of this risk is needed when the documentation is made to assist reconstruction. When building a replica of a boat, having this awareness can guide the builder in their material and procedural reconstruction, and can help them to decide whether to build with the same technical properties and measures as used for the original boat, or whether to focus on building with the same methods as those used when the boat was originally built. This is sometimes taken into consideration, but my experience is that boat reconstructions often focus on the material. To perform a documentation of a boat that can be used for both material and procedural reconstruction, it is important to be aware of the fact that the narrative, authenticity, and original context is affected by the documentation process.

THE LIMITATIONS OF ARTEFACTS AS SOURCES OF CRAFT KNOWLEDGE

There are, of course, limitations of artefacts' abilities to serve as craft tradition bearers. Sennett (2009) illustrates this problem with the example of Stradivarius violins. When Antonio Stradivari died, his family and colleagues, working in the same workshop, were not able to replicate the best violins. Since then, Stradivari's craft has never been successfully recreated, and present-day modern technology of analysing the technical properties of the violins has not been able to solve the mystery of his perfection (ibid., 74–77).

In experimental archaeology, artefacts from the past are being replicated and the making processes are tested in order to gain knowledge about historic cultures. Experimental archaeology is an established field of research concerned with material culture as sources of information from the past, and there are some good examples of studies that include the aspects of craft skill and knowledge in the reconstructions (Schenck 2015; Kuijpers 2019). People of past and present societies have studied and replicated old artefacts. The master-apprentice system should transfer knowledge from the master to the apprentice, but as stated earlier, in practice not all knowledge is transferred. Some aspects of the craft tradition, often minor aspects, will be lost in the transition process over time. These aspects may later be revitalised as the old artefacts are physical manifestations of these practices, and craftspeople have the general knowledge of the craft that is required to understand and replicate these aspects. The learning craftsperson develops his/her own skills, and a source of knowledge is the interpretation of artefacts from the past and from other geographical areas.

The skills and knowledge of the craftsperson provide good opportunities to interpret parallel craft traditions in other regions and to interpret the knowledge and skills that can be discerned from old artefacts. Recreation of historical artefacts and skills are today well-established fields of study within experimental archaeology and the emerging field of craft science. However, there is no reason to believe that interpretation and recreation of old artefacts is a new phenomenon. Craftspeople throughout history must have observed and interpreted old artefacts created by bygone masters. These processes of reclaiming knowledge from artefacts can be labelled as experimental archaeology or time-gap apprenticeship, or they might just go on as an unlabelled part of a universal system of how people in societies learn things. Boats and tools are artefacts that, in the case of boat building, can be regarded as containers of forgotten knowledge. The knowledge of these artefacts can be deciphered by craftspeople and added to the craftsperson's knowledge. Integrating this into the concept of craft tradition is a long and ever-changing process where the craftsperson acquires skills from their teacher, revitalises forgotten skills, and adds new skills from parallel traditions. The label of 'documentation' of boats indicates that documentation is a formal process of collecting data for a museum collection, but if this process was instead referred to as 'learning from old boats,' this label would indicate that it is a part of the boat builder's traditional learning process.

SUMMARY

Craft tradition is a process where knowledge is handed over from master to apprentice, but there is also room for change within this process. Knowledge and skills can be added to the craft tradition from parallel traditions and even from the study of artefacts from the past. *Documentation*, the recording and interpretation of artefacts, is a process where knowledge and skills from past craft traditions can be derived. The artefacts can witness past cultures and traditions. The researchers who perform this kind of documentation need to have both theoretical insights and practical experience. A craftsperson can often provide the practical experience needed to better understand and interpret an artefact made within a craft tradition. That is why the *documentation* of artefacts ideally should be performed in cooperation with craftspeople or by a craftsperson. The craftsperson's role in the research is then to interpret the *craft traditions* of the past and how they relate to the *craft traditions* of the present. However, even if the *craftsperson-researcher* is highly skilled, artefacts have limitations as sources of craft knowledge, and awareness of this fact should be present in the documentation process.

When documentation from the perspective of the craftsperson is put into the field of craft sciences, the tangible heritage is a source of information that can be converted into new craft skills or revitalised craft traditions. In this chapter I have described how the craft perspective in the documentation process presents new opportunities to interpret historical artefacts and recover craft traditions from the past, and how it can enrich contemporary craft tradition.

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Craft Knowledge in the Service of Archaeology: Tracing Skill, Knowledge and Invisible Tools through the Artisanal Perspective

By Katarina Botwid

INTRODUCTION

Interdisciplinary research involving both artisans and archaeologists has the potential to contribute to forming and posing new questions within archaeology. Almost all artefacts exist because of the coming together of hands and material. Clay is clay, soft and malleable until dried and fired; wood is wood, to be cut and carved by persistently wielded tools; and fibre is fibre, twined together by nimble fingers and made into rope or woven into fabric. The embedded quality of different materials dictates certain human actions in order to be formed or transformed. As a consequence, a wide range of craft practices still live on from ancient days. In some ways, an artefact can be read as a message from one artisan to another. The artefact belongs to a context, a connection—a society, a time, and a practical reality. My work is about how we can implement the knowledge of practical expertise in archaeology as we implement the chemists' analyses of C14. Archaeology is not only a theoretical but also a practice-based field. When archaeology was initially formed into a research subject, practical experiments were tried out by contemporary researchers (Trigger 2006). This is still the case today but in contemporary archaeology there is a distinction between experimental and *experiential* archaeology (Cunningham, Heeb and Paardekooper 2008; Nilsen 2011). The archaeological experiments are staged around technological questions and the experiential archaeology is the gathering of experiences of interpreted ancient working and living conditions.

Being an archaeologist with a master's degree in ceramics, I have worked from an artisanal perspective in contemporary archaeology. Through this approach I have been able to contribute with new knowledge, even in already thoroughly researched find assemblages. The combination of academic archaeological studies and artisanal skills and knowledge provides me with code competence in ceramics but also, to a degree, in general craft processes. In this chapter I hope to show that possessing skills in craft is a relevant source of information to archaeology. Drawing on my own tacit knowledge, the present investigation centred on in-depth validations of the craft and skill performed in vessels that were made by Roman Iron Age ceramists. This interdisciplinary approach has been practiced for archaeological interpretations of craft in my research since 2009 (Botwid 2009a; 2009b; 2013; 2014a; 2014b; 2016a; 2016b; 2017; 2020).

After thirty-one years in the ceramic craft, my own background involves an extensive knowledge of the theory of ceramics and a professional proficiency in ceramic craft, combined with extensive knowledge of archaeology.

To have the opportunity to demonstrate how another artisan—specifically, a prehistoric colleague—may have reasoned and worked is an extremely enticing prospect. My technical specialisation within ceramics/arts and crafts is prehistoric and historic firing techniques (wood-firing). Through this specialisation, my connection to prehistoric techniques became evident and led me to studies in archaeology. During my studies in archaeology I realised that my practical knowledge would be able to interact with this—to me—new academic way of explaining the world in words. Early on, I realised that I had something to say about the prehistoric artisans who had practised ceramic crafts before me. Ceramic craft has not died out like some other materials-based techniques; it does not have to be reinvented (Vincentelli 2004). As a combined ceramist/crafts teacher/archaeologist and researcher, I was posing artisanal research questions in a different way. The interaction between my two subjects became visible, there was only one way open: I wanted to conduct research on the possibility of grounding archaeological explanations upon practical knowledge—an 'in practice' perspective. The visual and tactile experiencing of the vessel gives information that can be written down and compared but also questioned by peer-artisans.

In this chapter I want to show the potential in inviting a group of practitioner's to join me in this pursuit. The purpose is to demonstrate what professional artisanal skill knowledge can contribute to archaeological interpretations. I choose the terms *artisan*, *artisanal*, and *artisanship* over *craft*, *craftsman*, and *craftsmanship*. An artisan is a worker in a skilled trade, especially one that involves making things by hand (Oxford Dictionary 21-12-21). The term *artisan* has a neutral gender-free connotation and is commonly used in pre-historic archaeology, where the term includes *all* people involved in the making of material culture. In pre-historic archaeology, words that have connotations to contemporary concepts such as art, art and crafts, etc., are avoided. It is a choice to be inclusive and not label ancient makers of things.

THE ARTISANAL PERSPECTIVE

Combining knowledge from two arenas—archaeology and craft—I have, in earlier work, shown how the artisanal perspective can contribute to the understanding of prehistoric societies (Botwid 2016). I will here briefly present contemporary research in detecting artisanal knowledge and levels of skill including the essence of my research concerning artisanship and thereafter the methods that I use to trace and build up an artisanal understanding of the past.

Decoding knowledge in an extensive archaeological material, the process of assessing skill-levels, makes it possible to compare artisanal knowledge over time or geographical distances. There are a few archaeologists dealing with this issue, using skill-assessment in their research (see, e.g., Budden 2008; Budden and Soafer 2009; Botwid 2009a; 2009b; 2013; Kuijpers 2013; Botwid 2014a; 2014b; 2016; Botwid and Eklöf 2016; Sperling 2016; Botwid 2017; 2018; Kuijpers 2018; Sperling 2019; Botwid 2020). Uwe Sperling (2019) addresses skill in five levels, studying the complexity of the skill demanded in metal craft. Sperling's way of differentiating skill levels in *crafting* is not connected to the specific artefact or its features. His levels are very useful when discussing what can be referred to as common work vis-à-vis skilled artisans' work in a crafting community and in division of labour (Sperling 2019).

In contemporary research, the division of levels of skill concerning practice is often rather crude. There are often only two levels defined: "the excellent practitioner" and a single level incorporating all the others (see, e.g., Pye 1978, 4–8; Molander 1996, 33–56; Gustavsson 2002, 88–90). These scholars also discuss practical work and the practitioners' development, their relations to master apprentice learning and learning-processes, and making great contributions in their fields (philosophy, pedagogics, and design). Studies of *acquisition* of skill, as demonstrated in Dreyfuss, Dreyfuss, and Athanasiou's work *Mind over Machine* (1986) provides five stages of skill-acquisition in the area of artificial intelligence (AI). *Acquisition* of skill can of course be discussed in archaeological contexts with connotations to the context and the social status of artisans (Budden and Soafer 2009) but cannot be used to evaluate *technical* artisanal skill visible in an artefact.

Sandy Budden (2008), a ceramist and archaeologist in the United Kingdom, uses three divisions to evaluate every step in the process of the manufacturing of pots. She uses the categories good, moderate, and poor (2008, 2–3, 10–11). Her work is an evaluation of every pot (not too fragmented) connected to the artisanal skill invested in every form (e.g., cup, vessel, and plate) and how skilled you have to be to produce them. This division of forming is deeply connected to a *specific place and timespan* in which the pots were made and the result is used to discuss social relations, as well as skill investment in artisanal learning processes and communities (Budden 2008; Budden and Soafer 2009). The evaluation of skills concerning ceramics is similar in Botwid's and Budden's artisanal interpretations, and the most obvious differences lie in the way the acquired information is used.

Researcher Maikel Kuijpers undertakes research on skill and craftsmanship. The fact that my own approach to skill in archaeology and that of Kuijpers have reached closely related conclusions is highly interesting as we have reached them from different points of departure; Kuijpers from the theoretical side of archaeology with a great interest of skill in metal craft and I from the ceramic practitioner's perspective. Kuijpers gathers information primarily by working together with skilled contemporary artisans, such as his collaboration with the skilled bronze smith J. Zuiderwijk (Kuijpers 2013).

Kuijpers has conducted interpretations of early bronze age axes using categories of level of skill in a very similar way that I have. His levels are as follows: amateur (lowest level of skill), common craftspeople (skilled but do not stand out), master crafters (produce a high level of perfection, admired by peers), and virtuoso (explores the very limits of the material, unique, highly skilled). In Kuijpers's division of four levels of skill, the first three bear many of the same signatures as those I have put forward (see below), but the additional fourth level that provides the level of exceptional skill (included in my third level) also includes *social status* and context which, in my mind, makes that level more uncertain or dependent upon timespan or context (Kuijpers 2018, 562–63). To explain my standpoint in this matter, I cite Kuijpers, who adds that as well as the exceptional *technological knowledge* on the part of the virtuoso-level practitioner,

> These are highly skilled artisans who create objects that are likely to be laden with ideological and political meaning, individuals who are admired (or feared) for their exceptional skills by the community, which lead to a special social status (Helms, 1993). (Kuijpers 2018, 563)

I prefer to have Kuijpers's ideological and political or social circumstances (in the description of the fourth level) as a factor in the interpretation process grounded in the specific archaeological material and contexts at hand, not in the division in skill levels (see also Olausson 2008).

The skill levels I define concern only the *technological skill of the artisan*; the context is not taken into account and is left to the *archaeological interpretation*. I argue that craft knowledge, which is present in technological traces and built into an artefact, can be sensorily assessed and analysed by a skilled artisan in the craft at hand. These assessments make a grounded judgement of the level of skill held by the maker of the artefact (Botwid 2009a; 2009b; 2013; 2016). The levels of skill in *artisanal interpretation* can be used across a range of crafts and do not exclude any practical way of working, though every craft needs to find the adequate parameters, traces, and signatures (Botwid 2016) and is therefore usable in a broader meaning.

METHODS

Artisanal interpretation relies on tacit or silent knowledge. These forms of knowledge are mostly explored within the fields of theoretical philosophy of knowledge, evolutionary biology, pedagogic research, and in craft research (e.g., Polanyi 1966, 39–43; Pye 1978, 4–8; Molander 1996, 170–71; Gustavsson 2002, 88–89; Niedderer and Townsend 2014; Gärdenfors and Högberg 2015). Some research refers to this concept as embodied knowledge or "knowing in action," implying that it is not possible to learn without practicing until the knowledge gets into the individual's own physical motions, and becomes a part of him/her as second nature (see Polanyi 1966; Marchand 2010).

My intention when proposing (and developing) a practical sensory assessment method based on tacit knowledge and declarative objective criteria (artisanal interpretation) was that it should have a wide application to different crafts and topics, and that it should allow for the possibility of dividing or evaluating skill using the interpreter's own artisanal knowledge and experience or by consulting artisans.

The assessment of the artefacts in this chapter derives from one particular site. The first case study consists of my own artisanal interpretations of the ceramic artefacts and the three following case studies consist of artisanal interviews with a fine woodworker, a textile artisan, and a farmer. Each of them was approached to take part for their skill, expertise, and experience in their respective field of practical knowledge in a specific occupation. They were invited to separate one-hour semi-structured interviews (Bryman 2012, 419) and were prepared with information about the site and the context, as well as given the possibility to influence the setting of their participation. The artisanal interpretations would have benefitted greatly from the opportunity to conduct hands-on examinations but there was no possibility to do so at the time (the museum could not give access to them as the items were being exhibited). This circumstance makes the evaluations of skill more declarative and reflective. Still, I find the participating artisans' assessments highly interesting and a valuable contribution to archaeology.

The qualitative semi-structured interview guide I use starts by asking both the artisan (or the consultant expert) and the archaeologist (in this case, me in my role as archaeologist) to position their own skill in the craft at hand. This is done to reveal the level of understanding and to pose the starting point. It creates a mutual understanding which is beneficial for both parties. The interviews are concerned with *how* the artefacts were made as well as how the contemporary artisan interprets the ancient methods, the choice of materials, and working processes. After the assessment and interpretation, the contemporary artisan, with his or her own experience and skill as a guideline, evaluate the ancient technological knowledge invested in an artefact to one of the defined levels of skill (see below). The interviews were recorded and transcribed and all specialist terms and concepts were explained. The informants were then given the opportunity to correct any misunderstandings. The artisanal interpretation in my earlier work (Botwid 2009a) together with the presented case studies (cases 2, 3, and 4) completes the picture of skill present at the site of Käringsjön.

EVALUATION OF SKILL

The artefact with its various characteristics can be ranked according to different skill levels by judging the technical details of how it was created (Botwid 2013; 2016). In the development of the artisanal interpretation method (adapted for use and application in archaeological analyses of crafts), I divided this practical knowledge into three parts. The third part—beginners and less skilled artisans—was placed on a level where the practitioner had the least amount of skill and the lowest level of knowledge of techniques.

The three levels that make up the observable evaluation criteria (Botwid 2013, 31–34; 2016, 32–34) are presented and used as follows:

Professional artisanal skill: The artisan has experience over a long period of time and a very high level of knowledge. This individual is particularly skilful in her/his craft and can, in addition, move unhindered within the relevant field of expertise. An artisan who has attained a professional skill level takes risks and is able to completely resolve new problems by using the assembled knowledge s/he possesses.

Good artisanal knowledge: The knowledge that most artisans possess is traditional knowledge. The bearer of tradition is not particularly inclined to take risks, even if very skilled at the craft in question. Though not willing to deepen or proceed in knowledge development, such an individual is secure at a lower level of practical knowledge—a knowledge that s/he possesses and refines.

Artisanal knowledge: The lowest level of artisanal-technical knowledge displays craft that is performed by a beginner or by someone who cannot perform on an independent level. This individual can only work step-by-step on the basis of instructions, or proceed by trial and error without guidance. The execution shows clear technological deficiencies.

EXAMPLES OF ARTISANAL STUDIES OF ARCHAEOLOGICAL ARTEFACTS

I will present examples of how the artisanal perspective may reveal new information, thus expanding the archaeological interpretations of artefacts from an archaeological site. In the forthcoming

Figures 1–2: Käringsjön's location in the Swedish west coast area. Illustration by Henning Cedmar Brandstedt.

examples the aim was to re-investigate a Swedish Roman Iron Age site at the Käringsjön tarn and its artefacts using a strict artisanal perspective. Four practitioners make artisanal evaluations of four different (practice) areas: ceramics, wood, textiles, and farming.

The research was mainly designed to explore questions related to skill levels:

– How skilled were the artisans that came to be represented in Käringsjön tarn?

– For how long would the artisans have to practice before mastering the knowledge visible in the artefacts?

– Are there any signs of tools marks visible in the artefacts?

The four case studies used in this example could have been from any well-preserved excavation or historical context; however, the choice of the Käringsjön site is pragmatic as the artefacts here derive from different types of crafts and they are unusually well preserved.

PRESENTATION OF KÄRINGSJÖN SITE

Käringsjön has been interpreted as a Roman Iron Age offering site. It has been the subject of archaeological research since the Swedish archaeologist Källmark's excavation in 1917, followed by T. J. Arne and L. von Post's excavation a year later (cf. Arbman 1945, 174).

The site is situated in Övraby parish near the city of Halmstad on the west coast of Sweden (Figures 1–2). It became a well-known archaeological site in 1941, when archaeologist Holger Arbman excavated it extensively and published his results (Arbman 1945). Since then, several researchers have published papers and articles concerning the site (see Carlie 1998; 2001; 2003; 2009a; 2009b; Botwid 2009b). Arbman's interpretation of the tarn as an *offering site* has been accepted in archaeology since 1945.

In the Roman Iron Age, Käringsjön was a small tarn, secluded in the surrounding broadleaved forest. Hemp, flax, and rye were cultivated in the area

Figure 3: Reconstruction of Käringsjön and the vegetation present at the site. The reconstruction is based on pollen analysis and the interpreted water level, 200–400 AD. Illustration by Henning Cedmar Brandstedt.

(Figure 3). Spacious grass- and croplands characterised the landscape and environment (Björkman 2009, 204). When excavated and analysed, the majority of the artefacts at the site were determined to have originated from 200–400 AD (Arbman 1945, 116; Carlie 2001, 125).

The finds are briefly presented in the table (Figure 4). Surrounding the small tarn was a platform made from a large quantity of wood and stone. Notably, there were no traces of sacrificed war-booty or sacrifices of animals or human beings. Consequently, the tarn has been interpreted as a peaceful offering site where the local peasant population came to ask for a good year or to celebrate harvests (Arbman 1945, 100; Carlie 1998, 35; 2009a; Botwid 2009b).

REVEALING SKILL THROUGH ARTISANAL EXPERTISE: FOUR CASE STUDIES

The following case studies formed the basis for well-informed artisanal interpretations of the artefacts from Käringsjön. Ceramic evaluation (case 1) together with woodwork evaluation (case 2), textile craft evaluation (case 3), and farming (case 4) are undertaken in order to expand the knowledge of the skill embedded in the artefacts from the site.

CASE 1: Artisanal Interpretations of the Käringsjön Ceramic Artefacts

Starting with the artisanal interpretation of ceramic artefacts, the expert uses his/her senses—primarily vision, touch, and hearing, along with personal experience of the craft—to study how the vessel was created. Within the field of archaeology, as far as I am aware, only two experts have conducted skill evaluations out of their own expertise in ceramics: Sandy Budden (presented above) and myself. The parameters included in pottery investigations are performed by both experts and are as follows: weight, balance, structural integrity, size, thickness of vessel walls, amount of temper, manufacturing process and artisanal quality, selection of material, firing method and temperature, surface treatment, and decoration (Budden 2008, 4; Botwid 2009a; 2009b; 2013, 31–44; Botwid 2014, 60; cf. Budden and Soafer 2009, 10). Marks and traces are visible on the artefacts as imprints of the makers' hands or tools, and each artefact consequently carries evidence of a level of skill in a "frozen moment." In what follows, I present the artisanal interpretation of Käringsjön's ceramic artefacts (Botwid 2009b).

Käringsjön's ceramic material included 114 vessels and was interpreted through qualitative artisanal interpretation (Botwid 2009b). I had the opportunity to access 24 of these vessels for visual and tactile analysis. These vessels are presented as photographs in Figure 5. A further 23 vessels were interpreted only visually, as they were in exhibitions. These are presented as silhouettes. The 67 small sherds depicted each represent one vessel in very small pieces or fragments. The dots (white, grey, and black) represent the level of skill according to my artisanal interpretation.

The interpretation of the vessels in the study shows that 25% of the vessels reached the level of professional artisanal skill, 67% reached the level of good artisanal knowledge, and 8% reached the level of artisanal knowledge (Botwid 2009b).

Overall, Käringsjön's ceramic material shows very good performance of ceramic craft. The analysis

Categories	Type	Number
Ceramic artefacts	vessels, small cups, storage vessels, cooking pots	114
Wood artefacts	box-lid (1), bowl (1), knife-shaft (1), tray (2),	5
Wood/ agricultural implements	rake heads (2), spade (1), digging stick (1), pulley (1),chopping block (1)	6
Wood/objects	worked wooden objects unknown function	16
Wood/prepared	curly birch blocks	2
Wood/textile tools	linen-mallet?/flax attachment	2
Textile	processed flax	2
Bast	ropes	3
Stone artefacts	grinding stone (1)/flint (firemaking) (1)	2
Stone/prepared	worked flint (4)/quarts (1)	5
Iron/traces	Knife-shaft and stick with iron-oxidation	2
Leather	left-shoe, mended (medivial)	1

Figure 4: Finds in Käringsjön (Arbman 1945, 89–97).

revealed that so-called coarse household ware was sometimes made with professional artisanal skill. Vessel H21, for example, was light, even, and made with an excellent finish while a similar form, vessel H27, was thin, had uneven walls, and was asymmetric and clearly performed by an unskilled artisan or a recent beginner. Some of the fine-ware vessels, on the other hand, revealed the lowest level of skill, as finds nr A6 and L3 (Figure 5) show. These examples nuance the understanding of ceramic vessels because while such vessels have been commonly referred to as coarse household-ware, some vessels are simple and carefully crafted and some fine-ware vessels are crafted with the lowest level of skill.

INTERVIEWING ARTISANAL SPECIALISTS

The following cases presented in this chapter are the interviews with the fine woodworker Per Brandstedt (case 2), the textile consultant Linda Olofsson (case 3), and the farmer Kjell Davidson (case 4). Together with my own former artisanal interpretations of ceramics, the artisanal analyses are applied in the section below entitled "Artisanal Knowledge at the Käringsjön Site."

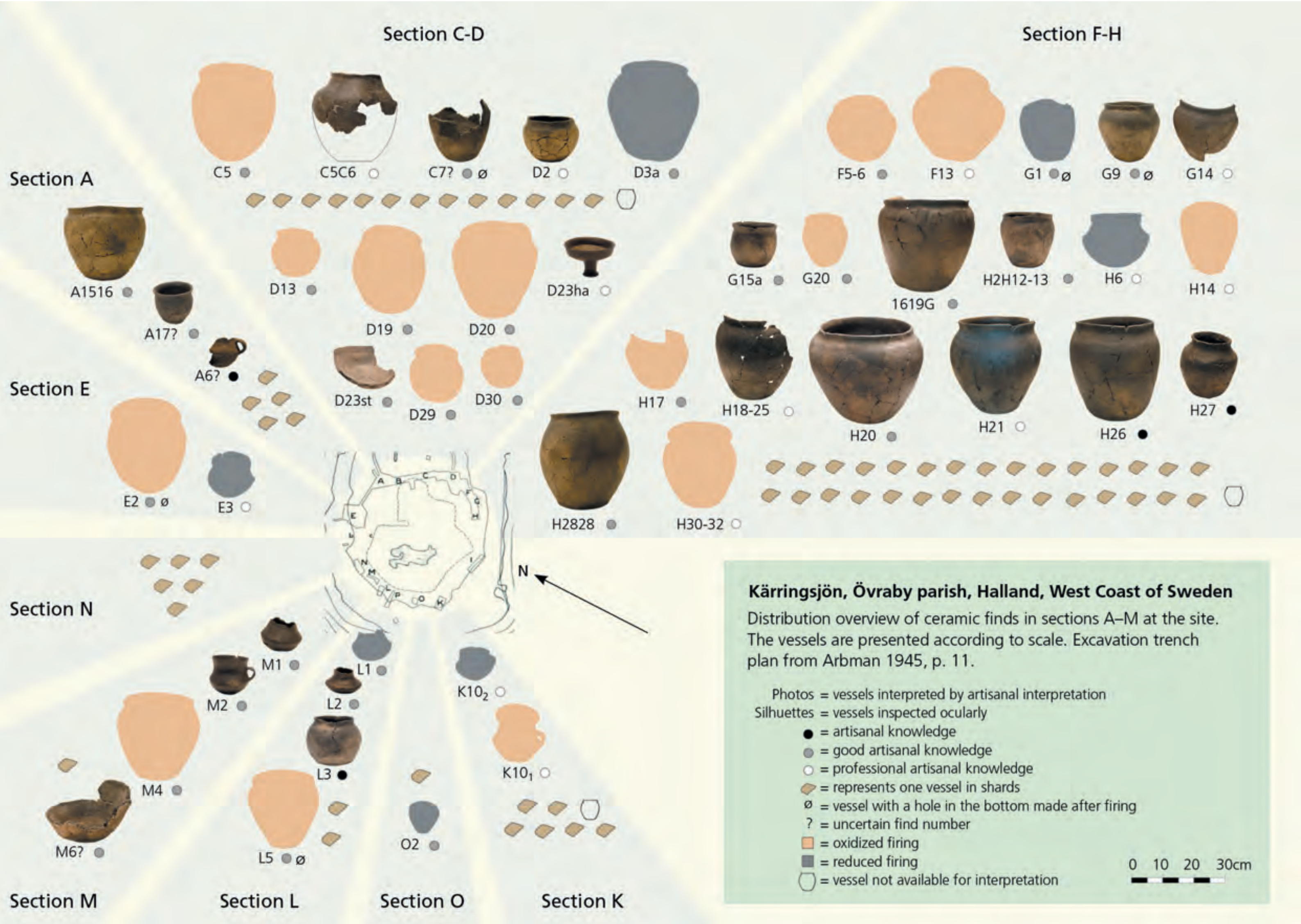
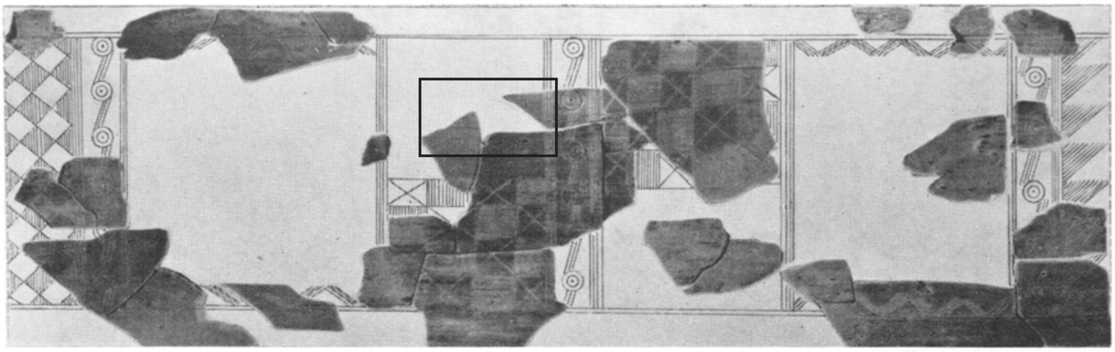
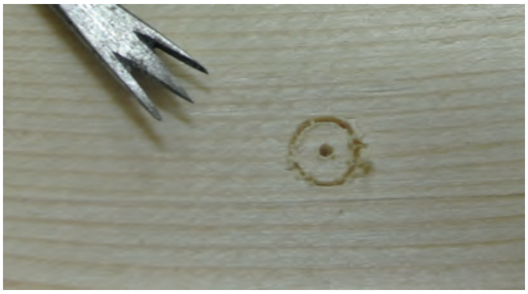
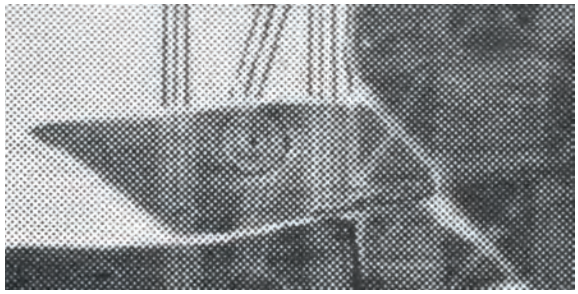


Figure 5: The ceramic finds (114 vessels) and their position in the excavated shafts at the tarn. Silhouettes represent the artefacts that could only be visually assessed. The small dots (white, grey, and black) represent the level of skill interpreted. Illustration by Katarina Botwid and Henning Cedmar Brandstedt.







Figures 6–9: (Above, Figure 6) Find D10 (Käringsjön), painted wooden lid, reconstruction by Dagmar Selling (1945), courtesy of Kungliga Vitterhetsakademien, Sweden. (Middle, Figure 7–8) The box lid D10. Comparing Brandstedt's suggestions and the actual photograph of the artefact D10. Photograph by Katarina Botwid and Holger Arbman, courtesy of Kungliga Vitterhetsakademien, Sweden.(Below, Figure 9) Brandstedt shows the tool and technique he proposes was used for decorations on the find.

CASE 2: Woodworker

Per Brandstedt is an internationally renowned Swedish woodworker in the area of arts and crafts. His experience of the craft is extensive and he has worked full-time for over 35 years, achieving master level in the guild of master craftsmen. As a master, he has taught woodwork to apprentices, both nationally and internationally. Brandstedt evaluates his own skill to be at the level of professional artisanal skill. Brandstedt was interviewed and gave his interpretation of the wooden artefacts in Käringsjön based on his own artisanal expertise. This interpretation reveals the skill and the artisanal choices that the ancient artisan was able perform. Brandstedt's general interpretation concerning all wooden finds from Käringsjön (farming implements and other artefacts) is that a high level of skill was present in the group of woodworkers. When discussing the decorations and ornaments (see Figure 6), Brandstedt was able to show the tool and technique that would have been used for the decoration on find D10 (see Figure 9).

Figure10: Artefact A3. Turned birch bowl. 11.5–14 cm diameter, 8.2 cm, with a lost lid. Photograph by Gabriel Hildebrand/The Swedish History Museum.

Brandstedt suggested an old type of drill, similar to the one in his own workshop, as the tool used on the actual artefact from Käringsjön. As shown in Figure 7, the tool fits perfectly and makes the same type of decoration mark when used without pressure. The original decorative mark appears to show that two drills were used, one smaller and one bigger, using the same centre.

Brandstedt evaluates the skill visible in some specific wooden artefacts. He puts the decorated box lid made from ash tree (find D10) at the level of good artisanal knowledge. The decorated wooden lid (D10) was made from an ash plank using the splitting technique. This gives the woodworker a very thin plate without the use of a plane tool, and the technique requires about five years to master. Using drills is a sign of a developed technical knowledge and supports the interpretation that the woodworkers near Käringsjön were able to reach a high level of skill.

Brandstedt interpreted that the artisan who created the turned bowl made from birch (find A3, see Figure 8) also performed his/her craft with good artisanal knowledge. Brandstedt estimated that this level of skill in turning wood would take at least four years to acquire.

When interpreting the chopping block from oak (F19) Brandstedt is sure that the block was as important as the axe for the ancient wood artisan. He interpreted that the block was deliberately put in the tarn as a valuable object for the woodworker. This information is new to archaeology and provides interesting information about specific artisanal understanding of the importance of tools and related objects (the axe and the chopping block, the hammer and the anvil and so on) but does not evaluate levels of skill (see Figure 11, number 6).

Brandstedt interprets and concludes that his ancient colleagues have been aware of different types of wood and how to use them in the most appropriate way. The rake is a good example, as oak, birch, and goat willow were chosen for their individual properties as part of its construction. Curly birch is an unusual kind of wood and was used for tool handles because of its hard property; the different directions in the wood would prevent the handle from breaking as well as providing a unique pattern (Figure 11. Finds D32 and A17).

CASE 3: Textile Artisan

Eva-Linda Olofsson is a textile-archaeologist, educated in both subjects. She has artisanal knowledge and experience of ancient textile crafting techniques and a degree in archaeology (BA). Her learning process in textile craft started at the age of five. Her artisanal knowledge was a starting point for her archaeology studies with an aim to studying textile-related topics. Olofsson is involved with craft-related work at Trelleborgs Museum and scientific archaeological experiments concerning textile crafts in international workshops and conferences at the Centre of Textile Research (CTR) in Copenhagen. Olofsson evaluates her own skill to be at the level of *good artisanal knowledge.*

In addition to Arbman's publication, more recent photograph printouts from the National Museum of History in Stockholm were used in Olofsson's interpretation. The flax material is limited to two bunches of flax. Ropes of lime tree bast were found. There are also wooden artefacts that are possible to discuss as potential textile tools (see Figure 11, numbers 3, 4, 5 and 7).

Olofsson interprets that the person (textile artisan) who produced the flax-bunch (find F1) showed good artisanal knowledge. This level of skill was discerned from the *particular choices* that the artisan had undertaken during the flax-making process. These choices concerned aspects of growing, harvesting, retting, and trimming. According to Olofsson, at this point in the process the artisan can choose to stop and gather bunches to sell. If working further, the next steps in the process of preparing flax are braking, swingling, and spinning linen thread, before weaving linen textiles. Olofsson suggests that the ropes of lime tree bast (finds A18, H19, E2) were made in different stages of the bast's drying process; fresh bast loses its twist when drying, while dried bast will keep its twist. It may appear that making ropes from dry bast requires greater skill, but if the purpose is to make a rope for one-time use, it can be sufficient to make rope from fresh bast. A good rope for repeated use should be made of dry bast or other fibres. The knowledge evaluated shows good artisanal knowledge in rope making.

The mallet of alder wood (find K12) seems to be a tool that could be used in the process of textile manufacturing. Olofsson interprets the mallet to be useful when breaking flax. This information is new according to former interpretations. Olofsson has a clear view of how she would use this tool in her own work, turning it for different edges for different purposes in the textile process. Olofsson also interprets the mallet to be useful when washing textiles.

Figure 11: Plate showing finds discussed in the article: Agricultural implements F3, H16, K1, K2, K12; 2. Rakes F4, F; 3. Distaff A5; 4. Flax-bunch F1; 5. Ropes, lime tree bast A18, H19, E2; 6. Chopping block F19, (top) (80 cm), curly birch D32 (raw material); 7. Mallet K12 (alder wood); 8. Knife-shaft A17 (curly birch); 9. K11 Wooden lock (swe: lekane) (oak). Photographs 1, 2, 6, and 9: Holger Arbman, courtesy of Kungliga Vitterhetsakademien, Sweden. Photograph 3: Annica Ewing/ The Swedish History Museum. Photographs 4 and 7: Peter Sillén/The Swedish History Museum. Photograph 5: Sara Kusmin/ The Swedish History Museum. Photograph 8: Gabriel Hildebrand/The Swedish History Museum.

Olofsson interprets find A5 as a possible distaff. Flax is sticky when dampened and will attach to the stick even if it is not designed in the same way as find A5. The *square form* of one end might imply that the stick could have been used as a distaff that was formed to fit a square hole in a plank that the textile artisan could sit on while spinning the flax. This way of working allows the use of both hands while using the spindle. This construction is easy to use in different surroundings—outdoors and indoors—according to Olofsson. Olofsson shows different ways of using a distaff without connecting it to a table or a plank, holding a stick in one hand and the spindle in the other. She also puts the distaff under her upper arm, pressing it to her body, which allows the freedom to use both hands during the spinning process. Another alternative is to attach the distaff to a belt, also enabling the use of both hands. If the distaff is used in this complex way, the artisan can be interpreted as having good artisanal knowledge.

CASE 4: Farmer

To understand the more complex world of farming and tool making, and to validate my own interpretations, I interviewed an experienced farmer. As a practitioner in a living tradition of (small scale) farming for generations, Kjell Davidsson represents and holds the knowledge that I hoped to take advantage of, in order to undertake artisanal interpretations of agricultural implements. When discussing the woodwork from Käringsjön, I mainly wanted to discuss Arbman's interpretation of the farm implements, tools, and skill. I was also interested in the daily running of farms. By interviewing a farmer, I hoped to gain insights into farming practices that were beyond common artisanal knowledge. Kjell Davidsson has been a farmer for forty-five years. Before working full-time from the age of fifteen, Davidsson was helping his parents in the holidays and during his free time. He considers himself as holding good artisanal knowledge—following a tradition without creating new ways of working. He notes that his father was more of an innovator since he had one of the first tractors in the area. Davidsson describes himself as a farmer who waits for evidence that new technology is working before he takes it up himself, and he does not like to take risks.

The agricultural implements analysed by Davidsson were made of wood (Figure 11, number 1). He says that these are implements that he is able to make himself, if he had to, and that he would be able to make them with artisanal knowledge or, for some of the implements, good artisanal knowledge. The rakes (Figure 11, number 2) are harder to make and would require more than the knowledge of a common farmer, according to Davidsson. He assesses that his father, who was good at handicrafts, would have been able to whittle rakes during the winter and maybe sell or trade some if he had had the interest for such work. Finds D10 (lid) and A3 (turned bowl) were not made using the knowledge of a common farmer, Davidsson argues. He suggests that they were made by a fine woodworker as they are much too specialised. Davidsson describes farming as a very complex kind of knowledge, where one is supposed to know a great deal about a great many things. For Davidsson, that is what makes a farmer a farmer.

Davidsson suggests that building houses and making fences are also a farmer's responsibility, and that special woodwork for buildings can be interpreted as being a joint effort between professional woodworkers and farmers. Davidsson says that both carpentry and smiting require knowledge that surpasses that of the common farmer and that such people would have had artisanal training. Artisans could allocate time to help others out (relatives, neighbours, villagers) during harvesting and other work-intense periods of the farming year, and consequently they had insight into the realities of farming.

When discussing the itinerant artisans, Davidsson mentions that knife and scythe (coulter) grinding were performed 'properly' by a knife-grinder once a year; during the rest of the year, a farmer would sharpen their own tools. Tinners (who tinned copper casseroles or pans) walked around the villages doing their craft in exchange for food and a little money, or something they could trade further. Itinerant artisans (for example, butchers from a nearby area) carried out slaughtering and dismemberment (primal cutting). "Everyone is not doing everything" is Davidsson's very short conclusion of this interview.

ARTISANAL KNOWLEDGE AT KÄRINGSJÖN

I am striving to give examples of how artisanal knowledge can provide knowledge that cannot be obtained in any way other than from consulting artisans. When I go through older archaeological investigations concerning, for example, ceramic artefacts, there are both factual errors and misunderstandings of technology and sometimes even strange reconstructions. Evaluation of skill from peer artisans (contemporary) is lacking in these former interpretations of craft. I have found that artisanal interpretations allow for the detection of irregularities and anomalies that otherwise seem to hide. New categories of artefacts can be identified using qualitative approaches from new craft perspectives (see also Westerlund and Thane in this anthology) and I am convinced that these perspectives can help to find additional traces of people, workshops, tools, and equipment. In the section below, the compiled interpretations give complimentary information about the artisans and artefacts at the Käringsjön site.

During the interview with Per Brandstedt (case 2), he demonstrated how the perfect circles on the lid (D10) were made. Using an old type of drill and a light hand, the circular marks were easily engraved onto the wood. Given this information I, as an archaeologist, can propose that the old type of drill was *also* used as a design tool and would thus have had a broad usability in various crafts, which is an obvious example of transferring knowledge between disciplines. The drill was actually used for decorative imprints. For an archaeologist, the perfect con-centric circles are not uncommon, and marks like these can be seen on bone (Müller-Karpe 1957, 35), wood, ceramics, and metal (Müller 1933, 72, 85–86, and Fig. 108; Ekengren 2009, 132). Brandstedt's interpretation of the technique behind the concentric circles opens up the potential for new discussions in archaeology about collaborations between artisans in many different ancient crafts.

Woodworkers from the Käringsjön environment were competent and had good knowledge about different types of wood and their usability (case 2). Curly birch, for example, was used because of its firmness, its specific surface, and its rarity. Complex techniques such as turning and splitting were used at the level of *good artisanal knowledge* and Brandstedt interpret that splitting was the more complex technique. Time-consuming training in a craft-moment (splitting) has, according to Brandstedt's information, thereby been established. According to Brandstedt, turning with an ancient lathe is not as complex as the splitting technique and takes approximately four years to accomplish (case 2).

Artisanal material was grown or taken from the nearby surroundings close to the settlements. Harvesting and preparing bast of lime trees was known, although lime trees were probably uncommon in the area (Björkman 2009, 201). Finds of rope showed that making or twining was known. Indeed, in the tarn there are preserved ropes of different sizes and qualities (see the evaluation of lime tree bast ropes given by Olofsson, case 3, concerning finds A18, H19, E2). The stages in preparing flax became visible as well as the possibility to work independently from a specially arranged working-space.

According to Arbman, sunken and decomposed artefacts tied with ropes (finds A18 and H19) could indicate the use of boats on the small lake (Arbman 1945, 108). The use of canoes or other kinds of small boats would require knowledge of boat building. As the wooden artefacts testify, the artisans had *good artisanal knowledge*, and, in turn, this might support Arbman's interpretation that boat building may have been known in the area.

Textile artisans in the Käringsjön area knew the stages of manufacturing linen (case 3). They were familiar with growing, harvesting, and preparing flax, and were using tools such as linen-mallets and flax attachments. Different ways of fastening the flax attachment may have been in use (Olofsson case 3). These interpretations were not noticed or discussed in former research. Olofsson's interpretation makes clear that it is possible to expect that knowledge of spinning thread and making yarn was known. The evidence shows that textile artisans had a *good artisanal knowledge* of the process, with a good grasp of textile technologies. Mobile constructions allowed the textile artisan to work flexibly and to take the craft elsewhere. Consequently, textile artisans had the possibility of working as itinerants.

I suggest that those who went to Käringsjön from surrounding settlements were linked to a wider understanding of *artisanal knowledge*. Some had a general understanding of craft while others had a deeper and very particular understanding of specific crafts. Artisanal knowledge may have been adopted in various ways, for example by learning from relatives in situations resembling so-called "situated learning" or "peripheral participation" (Lave and Wenger [1991] 2005). Artisans visiting the settlements could easily work together with artisans living in the existing artisanal environment (Botwid 2020, 241). Artefacts made in connection with foreign artisans (or foreign objects) can give a sense of hybridisation by cultural choices, showing an urge to connect to other artisans or to other artisanal traditions (Ekengren 2009, 24–30). In Käringsjön's material, the ceramic artefacts in particular visualise these kinds of cross-cultural expressions (see finds: L1, M1, K101, K102, G21, E3, and D23). Further, the everyday or domestic artefacts became of greater interest when the study showed that they were performed with such different levels of skill—the excellently manufactured storage pot (H21) contrasted by the poorly made pot (H27).

CONCLUSIONS

Revisiting a well-interpreted site years after the last publication might seem superfluous. As my own research developed from an individual project into an artisanal perspective that allowed me to reflect upon archaeological approaches that would broaden awareness of particular questions about artisanship (both in prehistory and in the present), it became clear that some questions about the site were unanswered. Being a ceramic practitioner and an archaeologist, I have the exceptional position of being able to analyse artefacts with my competence in ceramics *and* to put them into an archaeological context. My position gives me a special competence that gets better for every new examination.

After about ten thousand finds passing through my hands and eye, the amount of experience is higher than that of most archaeologists. Archaeologists often have to interpret all kinds of artefacts and also lead projects in excavation archaeology. It is rarer that the field archaeologist has the time and the economy to really concentrate on one artefact group. When I am included as an expert, I have time and also knowledge that I otherwise had to gather from literature or specialists. I asked myself if I could be more inclusive and involve other contemporary artisans when discussing or interpreting techniques used by prehistoric artisans. Therefore I wanted to find artisans from the field of artisanal expertise in woodwork, textile, and farming to collaborate with.

In the field of pre-historic archaeology, typological analyses have previously tended to focus on *when* a ceramic artefact was made and its shape (typology). But *how it was made*, the time taken to produce it, and the skills involved, to my knowledge have—with few exceptions—not been evaluated by contemporary artisans defined as specialists with contributory expertise (see Collins and Evans 2007).

A brief summary of Arbman's own interpretations of craft knowledge at Käringsjön, without consulting artisans, is useful to make the comparison clear. Fine-ware has been interpreted and referred to as more carefully crafted (Arbman 1945, 42), and this is an interpretation that has been reproduced over time (Carlie 2009a, 248). Alongside the ceramics, the excavation included different wooden finds (see Figure 2), which Arbman interpreted to be artefacts reflecting a *good knowledge of woodwork* (Arbman 1945, 84). Flax and bast were *placed in the tarn in a deliberate way*, according to Arbman, and sorted into small stacks and placed in different directions. This is obvious to the archaeologist but does not include artisanal knowledge. Arbman interpreted a stick as a distaff, used for spinning flax (Arbman 1945, 109). The deeper interpretation of an artisan's bodily movement and mobility together with the practical dimension (see case 3) of the textile craft is missing.

In conducting artisanal interpretations of Käringsjön ceramics, I have found that the simplest of household vessels could involve both tremendous skill and poorly made goods and that so-called fineware can be the work of a new beginner (Case 1). This research shed new light on the offering tarn, not seen in any of the earlier publications. We (archaeologists) know very little of the practices of so-called offering tarns of the Roman Iron Age but through this new way of focusing on *skill* in artefacts we can get a glimpse into the ancient practices at Käringsjön. How well made a pot was was not a hindrance when placing them in the offering tarn; while someone parted with an extremely useful and well-made vessel that could have served for much longer, someone else brought a vessel made by someone with only the most rudimentary grasp of ceramic craft. Both these artefacts were still placed in the tarn, a fact that could be interpreted in many ways, perhaps as a sign of a non-hierarchical community, but what I wish to stress is that this, in itself, is a new fact, reached by a new method of analysing artefacts.

Semi-structured interviews with artisans in crafts other than my own proved to be useful when doing in-depth validations of skill. The transparency in naming and writing down the different specialists' evaluation of the ancient artisans' skill is making what is often referred to as 'oral information' or 'personal communication' valid and possible to discuss with other artisans. I propose this as a basis for future peer reviewing of the craft specialists' assessments, enabling a more scientific approach to the collaboration between archaeologists and practitioners. I regard the lack of naming and thus the inability to compare their results as a scientific problem. Naming the artisans and presenting their expert knowledge and experience will further help this effort. Artisanal specialist informants were able to describe and evaluate the time and effort it would take to produce artefacts. Reflections about the artisans' close relations to, and emotions concerning, their own artisanal equipment and tools were illuminated—for example, the importance of a contemporary woodworker's chopping block (see, e.g., Niedderer and Townsend 2014). This is a telling example of how archaeology can gain the opportunity to assess the importance of an artefact which might otherwise be overlooked.

The interview conducted with a professional and experienced small-scale farmer supports the idea that specially trained members of the population could have been performing some work or crafts. Davidsson puts forward that a farmer has a broad knowledge and leads a life of hard and time-consuming work. The reasoning and reflection about a contemporary farmer's knowledge and the ancient farmer's knowledge bears evidence that the specific knowledge of turning wood, making linen, or producing a fine-ware pot may not have been in a full-time farmer's list of chores. One might envisage that a Roman Iron Age farmer who was in need of something that requires specific craft knowledge would be turning to an artisan with the skill, tools, and workspace for such a task. Based on the results, one can propose that the artisan at Käringsjön lived within the small-scale society as an experienced member in his or her artisanal arena, providing the items needed in everyday life and as a resource in farming. An artisan seems to have had access to some form of education from a skilled person or may have gone to other regions to learn a specific craft. The ideas of new or different design may have arrived with foreign artefacts, or from visiting artisans. Local artisans may have been travelling for some time and picked up ideas about form and techniques that were later applied and visualised in the Käringsjön tarn. To live in the settlements nearby to Käringsjön was actually to live in an artisanal environment and to take part in actions deeply connected to embodied knowledge.

In addition, the present reflections and interpretations of the artefacts were not included in previous studies of the tarn and thus there are reasons to believe the information was overlooked or inaccessible to the previous research team. I have not come across literature where I can read oral information which has been written down and approved by artisans themselves. On the contrary, I continuously come across publications where even the names of participating craft practitioners are left out—an omission of the very basics to make research comparable. My present study shows how archaeology would benefit from interviews with practitioners.

It is most gratifying to see that the contributed artisanal interpretations raised new questions that in the future may be answered in reflective, collaborative discussions between archaeologists and artisanal consultants. Through the studies it was also possible to expand the understanding—and interpretations—of how skilled the ancient artisans in the Käringsjön area were, and how long they had trained to acquire the knowledge visible in the artefacts.

In this matter, I want to contribute to those endeavours with a more balanced exploration of ancient artisanship, presenting additional information deriving from the deep knowledge of the actual craft. The visual or visual/tactile investigation cannot be carried out by a non-tactile expert. We have to acknowledge that some information can be found in the actual artefact hidden in the present archaeological material and that some information can be found in literature.

In the future, I hope to gather groups of archaeologists, craft researchers (practitioner-researchers with multiple educational backgrounds), and artisans together to explore a number of artefacts. Such a combinations of skills can help interpret and bridge the knowledge gaps between artisans and archaeologists. Hopefully, this would provide an unexpected impetus for further discussion and interpretation, yielding results and new questions that neither of the disciplines could bring out alone, thus further developing craft theory.

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MAKING AS RESEARCH

The theme Making as Research explores notions of artistic research through craft. Here, the act of making is, in some respects, a research process in itself. By forming material, we may form research questions that are answered only in the unfolding of a material processing of thoughts and tests. In the following three chapters, the idea of a making process as a way of communicating and understanding others is made visible. Anna Lovisa Holmquist's chapter "The Production Novella as a Textual and Visual Narrative Method in Craft-based Design" visualises and communicates the atmosphere of the deteriorating small-scale factory environment through both images and words, raising questions of the borders between manual and production-based craft practices. In Birgitta Nordström and Camilla Groth's chapter "The Role of the Weaver in the Encounter with Life and Death" craft practices are used as a means for engaging and communicating difficult issues between people and as a way to soften the culture of meeting death. Meanings inherent in and through both craft objects and the craft practice itself are vented in the chapter "On Wheel-throwing and Meaning" by Mårten Medbo.

Anna Lovisa Holmquist is a founder of the art and design studio Folkform, and a PhD candidate at the Royal Institute of Technology in Stockholm and researcher at Konstfack University of Arts, Crafts and design. Her practice-based thesis project focuses both on design and on materials and the last Masonite factory in Sweden. Folkform first entered the public spotlight with their experimental work with Masonite boards. Flowers and plants were pressed into the material, providing it with a brand new expression. Folkform is now an international name and has received several prestigious design awards. Among other venues, their work can be found in the permanent design collection at the Nationalmuseum in Stockholm and the National Museum in Oslo

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The Production Novella as a Textual and Visual Narrative Method in Craft-Based Design

By Anna Lovisa Holmquist

INTRODUCTION

For many years I have been working as a designer at Folkform, the design studio I co-founded with my design partner Chandra Ahlsell in 2005 after graduating from industrial design at Konstfack University of Arts, Crafts and Design, in Stockholm. Folkform first entered the public spotlight with the experimental work with materials, especially Masonite boards into which flowers and plants have been pressed. Folkform have also been working with other small-scale local industries in Sweden and Europe. The design work at Folkform in connection to this research is focused on communicating our experiences working as designers collaborating with different manufacturers, meeting the skilled workers with knowledge of traditional methods of making both materials and objects, and manufacturing techniques that in some cases are threatening to disappear.

I have personally engaged in research as a doctoral candidate, and in this process I utilise my practice to inform my research. I see myself as a practitioner-researcher. Through my work as both designer and researcher I have developed a method for collecting, documenting, and representing my research data which I have entitled 'Production Novellas.' The novellas are written records of my memories during the design and manufacturing process which are supplemented with images taken at the sites where I worked. In writing these novellas in this context, my aim is to create an appropriate form to talk about and communicate local industrial production processes in the intersection between arts, crafts, and design. The Production Novella, in combination with an exhibition presenting the furniture or other objects, becomes a documentary research strategy through which writing and visualising of a design process which is close to the manufacturing behind artefacts can introduce an alternative academic discourse through narrative investigation. It has been developed in the context of design research, but also has the potential to address the field of industrial heritage research and practice. Local manufacturing cultures and materials, such as the Masonite board and the furniture made from this kind of hardboard material, are disappearing in Sweden due to the globalisation of production following the so-called third industrial revolution. This transformation has resulted in an increasing number of industrial remains, also providing the expansion of industrial heritage as an academic field (Storm 2008; Avango and Houltz 2013; Douet 2016; Geijerstam 2013). However, according to Wedin (2013), the research field of heritage studies lacks methods capturing processes from manufacturing cultures, such as industrial processes and the use of technical tools and machines, since the holders of the traditional skills and knowledge are lost.

Through my design work at Folkform and practice-led research, I journey into Swedish industrial heritage and aim to uncover new possibilities and to highlight local manufacturing cultures, people, and industrial processes behind the manufacture of our objects and furniture. At Folkform we have focused on exploring traditional industrial manufacturing techniques not only by embracing the value of tradition itself, but also by creating new meaning of materials through unexpected combination with novel components (for further reading on this work and the concept of *Innovation Through Tradition*, see Holmquist, Magnusson and Livholts 2019). The main focus of my doctoral research was the wallboard wooden material Masonite and the last Masonite factory, which was built in 1929 and located in Rundvik in the north of Sweden. For seven years, Folkform made furniture, new material, and interiors from the original Masonite boards produced in the factory in Rundvik, but we could not "salvage" the material made at the factory before its closure in April 2011 and the old machinery was sold to Metroply, a fibreboard manufacturer in Thailand.

The Masonite wallboards have a long tradition in Sweden, but the manufacturing process originated from the United States, where it was invented by Henry Mason in the early twentieth century. Sawdust, which was considered worthless, was converted into a new wallboard material. The Masonite process was revolutionary because instead of reducing the wood structure by chemical means, the chips were exploded under a seam press (Boehm 1930). The boards manufactured in Rundvik originated from the American patent by Henry Mason and therefore the term is spelt with an "e" at the end. In Sweden, Masonite wallboards became a popular building material during the 1930s. It was used, for example, as insulation panels during the winter and to build small cabins where families could spend their holidays during the summer (Fröberg 2004).

Since the closure of the factory, Folkform has been tracing the material and the reconstruction of the new fibreboard factory in Asia that is now being built utilising the previous Swedish machinery in Branchinburi, outside of Bangkok. While the new fibreboard material manufactured in Thailand will be using the machinery from the Swedish factory, it will not be branded "Masonite"; the new hardboard material will be called Metroply Fibreboards.

In many ways, the Masonite material symbolises a change in the Swedish manufacturing industry on a larger scale. This is something I have been exploring as a designer at Folkform and something

I'm trying to capture in my research by writing down my memories from different sites of production. For more than ten years, I have brought a documentary photographer to almost every factory Folkform has been working with and in this chapter I present an example of this documentation from a Masonite factory through the form of a Production Novella.

The Production Novella is an auto-ethnographic research approach based on the researcher's own experiences. Through writing and visualising the practice, the researcher seeks to describe and systematically analyse personal experience to understand cultural experience (Ellis, Adams and Bochner 2011). The field of visual anthropology has also developed approaches to visual representation to communicate research (Pink 2013).

The research strategy of writing Production Novellas is developed through the design practice at Folkform by Holmquist (Holmquist 2017). In the field of design research, Kristina Niedderer has pointed out the importance of individual methods. In her research, Niedderer has been exploring how different types of methods can be used within the flow of research (Niedderer 2009). The memory writing of Mona Livholts (2015a; 2015b) and her "untimely" academic novellas have also influenced my research approach. Livholts's interest is within narrative methods and reflective writing. Photographs are also used to capture the manufacturing process. This research approach is related to the field of visual ethnography developed by Sarah Pink (2013). The concept of a research diary has also been presented by professor of Industrial Design Owain Pedgley, co-editor of the Elsevier book series *Materials Experience*. In his research he suggests that the diary is effective in capturing design activity, is amenable to the verbal articulation of materials and manufacturing, and is suitable for practice-led research (Pedgley 2007). He further argues that practice-led research has significance because it empowers designers to utilise their design expertise and assert ownership of design research.

In my research, I too suggest the use of a form of diary. I use narrative methodologies, memory writing, and photography to enter and communicate the process of the production of artefacts, and to document and reflect on the complexity of materialities, artefacts, people, local environments, specific events, and interactions. *Folkform Production Novellas* is also the title of an exhibition at Vandalorum art gallery in Värnamo in Sweden. In the context of my PhD, the dissertation constitutes both a text-based part and the exhibition at Vandalorum, which was examined as part of the dissertation by the opponent professor Andreas Nobel.

Through the texts and images in the Production Novellas I invite the readers of my research—and also sometimes exhibition audiences—into the manufacturing process behind the objects and furniture we design at Folkform, and its industrial heritage and cultural context.

Later, the Production Novellas have also been used as a textual and visual narrative research method for collecting, documenting, and representing my research data through a combination of multifaceted genres, such as memories, notes, and photographs. Through these I explore how processes of change and globalisation have transformed cultural heritage. Through the Production Novellas and related ethnographic research such as visual ethnography, I aim to communicate our design process and the manufacturing behind objects.

Combined with an auto-ethnographic approach I am also able to visualise the collaborative process between the craftspeople and me, the designer, from an insider's perspective. Simultaneously, I also share knowledge and attitudes from the practice field while collaborating with the local manufacturers and their personnel, who are not pursuing research and thus do not document their everyday working environment. I thus wish to communicate the spirit and history of the places where the objects are produced, how the products were made, and by whom. In this way, this particular industrial cultural heritage—which is on its way to becoming extinct—is documented in a multimodal way that can be reflected upon and which shows more than words alone can. The text also makes clear how an exploration of the unexpected events and turning points that appear during the design and form-giving process through communication, correspondences, and photographs are key to the interpretation of the narrative and the told story.

This chapter will present one Production Novella from the process of producing Masonite hardboards. I will be explaining how the industrial heritage behind the furniture made at a particular site was visible. The materials were also tangible through the design of new objects and by highlighting the sites of production and the collaborative process between the craftspeople involved in the making. I have narrated the manufacturing processes and the context using photography as a documentary process to show the environment of the sites, the people, the machines, and the inventive co-creation processes behind the making of almost every object we designed. The diverse forms of written narratives and photographic images invite the readers into the manufacturing processes of different artefacts such as, in this case, a series of Masonite cabinets and the making of a new "Flowermasonite" material.

As a designer, I have personally experienced a time when design is becoming increasingly globalised, with local products being imported from countries where labour is cheap, the production process is anonymised, and it is often difficult for the consumer to trace the manufacturing process of a product. The distance between the designer and the location of production also increasingly distances the designers from gaining an embodied understanding of the production processes, the materials, and their properties as well as the manufacturer's intrinsic motivations or unwillingness to make unexpected changes to the normal manufacturing. When the designer is not familiar with the material or the procedures used in manufacture, the value carried through the special materials or contexts of the product is not visible in the outcome and is thus lost for the consumer too.

In contrast, when sensitive cultural heritage is carried along into the outcome of the product, it also carries additional potential for monetary value that could feed back into the preservation of the cultural heritage context. A transparent history of product origins and cultural heritage becomes especially important from an ethical perspective. How do we, as researchers, find a new language for practice without getting lost in translations between experiences, (material) knowledge, and theory, in a context of academic research?

The Production Novellas highlight a different perspective of the collaborative process between the craftspeople in the industry and the designer, who is also a maker and a craftsperson of sorts. The Production Novellas expand the sketch or drawing as they address the importance of other forms of language, such as images, but also the presence of frequent phone calls, working nightshifts, collaborative mistakes, etc. I suggest that this way of creating research data contributes to methodological development in the field of craft research as it offers a multimodal view of the contexts and the experiences of dealing with making and co-creation, and shows how and why the Production Novella can be a tool for creative and reflexive writing and visual narrative. Short stories based on written memories and photographs have an ability to capture fragments from the collaborative design process behind manufacturing and invite the academic researcher into this process. Through the Production Novella, I explore new ways of writing that may challenge the more traditional ways of writing academic texts.

CRAFT-BASED DESIGN AND VISUAL/ TEXTUAL RESEARCH METHODS

In this section, I will make use of my own experiences working as a practitioner-researcher to discuss methodological challenges in the academic field of craft and design. My experience is that it is a challenge for many designers to write about practice. In this anthology, Gunnar Almevik and Jonathan Westin discuss the "academic artefact" and suggest that technologies such as photography and video could be used for methodological purposes. They question the fact that despite the presence of new forms of media, the research that is successful in reaching formal examination or scholarly peer review is still that which is embedded in the authoritative frameworks expected of academic texts (Almevik and Westin, in this anthology).

As the American sociologist Laurel Richardson writes, how we are expected to write affects what we can write about (Richardson 1994, 927), which indicates that there is a risk that if we do not invent and shape writing that can communicate our work in a meaningful way, then the specific practice-based knowledge is silenced.

In the literature on design research, we see the distinction between research *into* design, research *for* design, and research *through* design (Frayling 1993). The foundation for the Production Novella is an approach grounded in the concept of research *through* design, where the artefact itself is viewed as a way to communicate knowledge. Design and craft have both evolved considerably since their nineteenth-century definitions (Cardoso 2010). In recent years, contemporary designers have become more aware of the presence of craft in factories and large-scale production settings and have used this as a source of inspiration (Holmquist, Magnusson and Livholts 2019). This craft-based design approach is relevant in the field of heritage studies and craft research since designers working in the fields are looking back through history to discover old traditions and manufacturing as an important investigative tool in the design process.

Social anthropologist Trevor Marchand is interested in the actual making of artefacts in his research. Marchand says in an interview that

> Craft as an idea, or a concept, could not exist without mass production and industrialisation. Its identity comes in the distinction it makes for itself as against industrialisation and mass production. In fact, I would say that there has been a really strong and steady interest in handicraft, and it's not just for handmade things but it's the politics that go along with it, and, increasingly so in the last few decades, there has also been the question of environment and sustainability. (Social Science Bites 2015, interview with Trevor Marchand)

In the craft-based design process, the practitioner is inspired by craft as a concept or idea and works with materials in the design process that possess rich histories, as well as small-scale local industries boasting long traditions. Craft-based design explores the combination of craft and mass production, and aims to move beyond the old dichotomy of craft versus design.

THE PRODUCTION NOVELLA AS TEXTUAL AND VISUAL METHOD IN PRACTITIONER-RESEARCH

Through a practice-led methodology I combine both auto-ethnographic and visual- ethnographic methods via the Production Novellas. By using this combination, I aim to communicate craft-design practices from a particular standpoint, attending to the voices from inside the practice of manufacturing. Through participating in the co-creation process of the furniture and objects with the practitioners I meet in the research context, our creative practice also accumulates research data for the study. The memory fragments from my Production Novellas were created during my PhD project and were written by me between 2011 and 2021 (only one of the texts on the design work at a Masonite factory is published in this anthology). They describe design work and the collaboration between me and my design partner and skilled craftspeople from inside different manufacturing facilities in Sweden.

Working with visual material like photography is an important part in my process of remembering and communicating my research from different sites of production. In "Working with Memories and Images" (2015b), Mona Livholts argues that photographic images extend the analytical creativity and reflexivity and open up spaces for dialogue. Photographs act as triggers for my memories and become a way to tell a broader audience about the people and techniques involved in manufacture. I am also inspired by the writer John Berger and the photographer Jean Mohr and their book *Another Way of Telling: A Possible Theory of Photography* (1982) and the writings by Berger on the relationship between image and text. Berger (1972, 15) argues that seeing comes before words. It is seeing which establishes our place in the surrounding world. In my Production Novellas I use images to remember, to notice the details, and to communicate with other readers and practitioners. A long-standing phenomenon, according to craft researcher Gunnar Almevik and his co-author and research partner Jonathan Westin based at the Craft Laboratory at the University of Gothenburg, is that the academic system is very much reliant on textual output, while craft research has a particular need to substantiate the process of making - its motion, sensation, vision, and haptic experience – through multimodal means of communication (see Almevik and Westin in this anthology). The more practically oriented disciplines, however, rely on images to illustrate and evidence the arguments made in the text. This could be contrasted with visual methodologies such as visual ethnography, time-geography, and the photographic essay, where the production of the image is central to the thought-process and the argumentation. In this anthology, Almevik and Westin question the "academic artefact" and suggest new research possibilities which are less focused on written research descriptions. They argue that craft research needs to substantiate the process of making, and mention as an example the first doctoral candidate of craft in Sweden: Mårten Medbo. Medbo's PhD dissertation (2016) is a hybrid, with a clay-based part and a text-based part. Almevik and Westin discuss the tradition of scientific visualisation (see this anthology) and mention that many research fields translate different aspects of the physical reality into visual media, such as in the field of archaeology where the use of visual material, such as section drawings and vase profiles, has a long tradition. For example, in craft research, Patrik Jarefjäll has used video and time-geography as a visual method (Jarefjäll 2016). The creating of visual material in the Production Novellas has been conducted in collaboration with a professional documentary photographer, Magnus Laupa. He was chosen to join Folkform on the journeys to different factories because of his previous experience of documentary work capturing the life of people, but also because of his artistic expression and method of using an analogue camera, which is a craft skill too

The different local sites of manufacturing constituted the setting for each series of photographs included in each Production Novella. The photographs were created in a collaborative process between me and the photographer. I was directing the viewpoints documenting the manufacturing, since the emotional and aesthetic qualities of the photographs are an important part in the Novellas. When arriving at the site of manufacturing, I was in constant dialogue with the photographer. It was important to get the overall visual appearance of the images, creating the production narratives, to communicate the knowledge of the techniques and tools of manufacturing visually in the way I was aiming for. In parallel with directing the visual work, I was involved in the manufacturing of the product.

Photographing is not a neutral activity, but always an active production of images through selected viewpoints of buildings, environments, and people. A photograph preserves a moment of time (Berger and Mohr 1982, 91). For me it was important to focus on the key events of industrial manufacturing and the craft of the people involved in the production of our furniture and objects, but also on the appearance of the sites of manufacturing and to capture the part of the design process that is happening inside the factory that is often lost or forgotten.

FOLKFORM PRODUCTION NOVELLAS

In what follows, I present furniture made from Masonite fibreboard designed by Folkform, and my written and visual work from experiences of manufacturing, suggesting memory work and the Production Novella as a narrative methodology. This part of my chapter consists of a selection of photographs and writings from working with the Masonite material. The photographs were created between 2005–2020 in collaboration with photographer Magnus Laupa who captured the processes involved in the manufacturing. Most of the documentation was created with a Pentax using analogue film. The photographs were first published in the self-produced exhibition catalogues "Folkform Production Novellas" (2016; 2019).

Production Novellas Part I: Memory Writing

The Hardboard Industry (Rundvik, Sweden)

The Production Novella is based on my memories of experiences from Folkform's design work inside the last Swedish Masonite factory in Rundvik in 2005 and the collaboration with the head of the laboratory, Jan Persson, when we were carrying out the first experiments for a new material. Flowers were pressed into the hardboard, creating a completely new material. The text was first published in the Masonite Memoriam exhibition at Svenskt Tenn in the spring of 2012.

April 2012

It has now been seven years since we laid down the first flowers at the Masonite hardboard factory. In May, the whole factory will be transported to Thailand. The Norwegian group has sold the wood processing to Metroply in Thailand and the old machines from Rundvik are to be reassembled at a new facility near the Cambodian border. Nordic pine will be replaced with Eucalyptus as the chosen raw material. For us, the collaboration with the Masonite hardboard factory was important since it marked the beginning of a series of design projects in which the vicinity to the production was a fundamental and essential part in the story of the *final product. The visits to the hardboard factory and, later on, to the metal foundry and the glass grinders also became stops on a voyage into the history of a dying Swedish industry. By focusing on the places, the craftsmanship, and the industrial manufacturing processes behind the products, we wanted to shed light on new opportunities but also to have an impact on this manufacturing industry on the brink of extinction before it was too late. In a time where many of the products we consume are imported from countries where labour is cheap and the production is anonymous and impossible for the consumer to trace, the sincere and transparent story of a product's origins is more important than ever. Our project also reflects the current social debate regarding the role of globalisation in terms of the manufacturing industry and constitutes an attempt to initiate a discussion of the rate at which local craftsmanship and production techniques are disappearing. In the expanding global market it is near impossible for a designer to work with production still based in Sweden.*

About the Location

The first time we visited the factory in Rundvik was an early winter morning in 2005. The Head of Laboratory, Jan Persson, collected us from the airport. After what seemed an eternity in his blue Volvo on a country road lined with dark forest on each side, we drew closer to the factory. We were completely taken aback—it felt as if time had stood still since it was built in 1929. The beautiful brick building with its majestic chimneys was still being used and we were given a tour of the factory. Steaming wood pulp filled the space with its particular odour and the loud noise of the machines was persistent—almost frightening. The heat was overwhelming. Jan Persson showed us the large steaming press that would compress the Masonite material. He showed us the machine hall, where hundreds of gears and engine parts lay spread across the floor. We said a quick hello to the factory employees, who were sat in a circle having their coffee break. What does the Masonite hardboard factory tell us about the time we are living in? Quite a bit, we would say. It tells a story of a globalised world in which the domestic manufacturing industry of Sweden has a hard time competing with cheap products from low-waged countries. The factory also symbolises a different story, namely the one about how energy-consuming manufacturing processes and crafts are disappearing in Sweden. They will never make a profit as the energy costs are too high. In their wake, a complex environmental debate follows. We live in a society of mass-consumption that breeds a system built on long-distance transport and production in low-waged countries.

The Woodchip Pulp

When the factory was still operational, it was surrounded by ten-metre-high mountains of woodchips from the surrounding sawmills. This waste constituted the material that the boards were made of. The woodchips were mixed with water and compressed under enormous pressure. This cheap, local, raw material from the great forests of Norrland was the fundamental element in the manufacturing of Masonite hardboard. Items made from wood have long been one of Sweden's most important products. In Rundvik, Västerbotten, the first Masonite factory was built in 1929. Masonite was a cheap surface material designed to utilise the woodchips produced by the sawmills. The woodchips are mixed with water and then compressed. Thus the resulting board material is both environmentally friendly and renewable. During the 1930 Stockholm Exposition, Masonite was one of the foremost construction materials used. There are few materials with as much inherent theory of knowledge as this hardboard. Underneath its surface lies many layers of history. Masonite is closely linked to functionalism and during the Stockholm Exposition in 1930 it was used as a construction material in several of the model houses that were built for the exposition. The areas of use for the material seemed limitless during this period. The Masonite hardboard was part of the construction of the Swedish Welfare State and became a symbol of the period's belief in the future.

Since the hardboards were used all over Sweden at this time, and by a large part of the population, you can still find traces of them today. Many people have a well-established personal relationship to this material and would recognise the surface anywhere. Despite the fact that in later years the material has unfortunately mainly been hidden inside ceilings and behind veneer, it was definitely a challenge to breathe new life into a material with such an extensive history.

Mass Production and Craftsmanship on the Production Line

How did we come up with the idea of pressing plants into the boards? This is a question we have attempted to answer many times. To us, it seemed too obvious to just create yet another "product," which was the aim of the particular design competition advertised in 2004 in connection with the 75th anniversary of the factory. Instead, we wanted to alter the composition and expression of the material by blending a new material into the wood pulp. We came to the conclusion that organic materials, such as thin plants, would be best suited to this purpose since they would combine with the wood pulp to create patterns on the surface. We drew up a sketch of a Masonite hardboard with plants pressed into the surface, and submitted it to the competition. The material did not yet exist, other than as an idea. After a few weeks, we heard from the competition jury, who announced that we had been given an honourable mention and that the material would be exhibited at the architectural museum in only a few short weeks. However, the flower Masonite was still just a sketch. We now had to quickly get to the factory and initiate the practical implementation. We received an invitation from the Head of Laboratory, Jan Persson, who was an incredibly important person in this process because it was he who believed in our ideas. We booked our flight and bought as many flowers and herbs as we could carry from Hötorget in Stockholm. With a carrier bag full of flowers each, we arrived at the Rundvik factory. Our initial experiments were conducted at night, whilst the product line was not running. Jan Persson conducted all of the first tests with rose petals in secret and it turned out that our idea worked. However, the colour of the rose disappeared and we ended up with something that looked like wilted leaves. We climbed up the side of the production line where the Masonite hardboards were manufactured and began to scatter flowers, in order to form the patterns we wanted in the three minutes we had at our disposal as the regular production came to a halt on behalf of our flower experiments. With fear-tinged delight, we found ourselves literally in the middle of a mass production—in the heat, the loud rumbling noise, and the humidity from the press. Once the boards had been displayed at the architectural museum and published, we were commissioned by a number of architectural firms to create interior designs using the Masonite, for example, for the Fjällnäs Chapel and the head office of Diligentia in Stockholm. We received so many requests that we had to stop buying flowers at Hötorget and instead initiated collaborations with various herb gardens in Västerbotten, who would deliver sacks full of herbs directly to the factory so that we could make our hardboards on a larger scale. When the first sack of thyme arrived early one spring morning, the staff at the factory entrance thought that the delivery had ended up in the wrong place and ardently argued, "This is a Masonite factory, not a restaurant." We began designing our own furniture using the floral hardboards and once we had exhibited them at the Milan Furniture Fair, we started getting orders from all over the world. It is absurd to think that the last order of flower Masonite we received prior to the closing of the factory was from the Queen of Jordan, who ordered boards with pressed-in olive leaves. These boards turned out to be the last we ever made.

The Masonite Cabinets for Svenskt Tenn

On 4 April 2011, the last Masonite hardboards were manufactured in Rundvik. The steam press is now silent. At about the same time as the fac-

tory closed, we received a call from a man called Per Wikström. He is the grandson of Carl Wikström, the man who founded the Masonite factory in Rundvik in 1929. Merchant Carl Wikström's son, the engineer of the same name, followed in his father's footsteps and was fascinated with the properties of Masonite. In the 1950s, he started his own board-processing factory in Eklången, just outside of Eskilstuna. The old warehouse of this old Eklången factory held a few well-preserved, original hardboards from the mid-1950s of varying colour, surface structure, thickness, and perforation. Per Wikström wanted to know if we would be interested in using these boards. We arranged to meet him and, excited, we went to the warehouse to take a look. Among the boards, we found Masonite leatherboards that were manufactured in Rundvik during the mid-1950s upon the initiative of Carl Wikström. Special cylinders with leather patterns had been designed for the steam press in the Rundvik factory. The board were used for items such as dados, bevelled, and coloured mouldings to disguise joints. The Masonite was spray-painted at first and would later be curtain coated whereas the leatherboards would be roller coated in a second shade to create depth. Manufacture of the classic, perforated boards also started in the 1950s. When metal hooks were attached in the holes, shelves as well as tools could be mounted upon them. The perforated Masonite hardboards that were mainly delivered by Carl Wikström to hardware stores were a product that stuck around for a long time and which was challenged by similar makes. Based on these original boards from the 1930s and 1950s and those very last boards produced at the factory in April of 2011, we now design the unique cabinets. Each cabinet is a collage of Masonite from different time periods and a memorial monument to the last of the Masonite factories that are now sadly being closed down. How come we chose to collaborate with Svenskt Tenn and work with material that is more than 80 years old? Perhaps we were looking for something timeless, something original and durable—a subtle criticism of the constant quest for the next new thing. Above all, the cabinets constitute an attempt to make people see that production and craftsmanship is rapidly disappearing from Sweden. Svenskt Tenn is one of the few furniture and design companies in Sweden that was around at the time when the Masonite factory was started and that is still here. Estrid Ericson founded Svenskt Tenn back in 1924. The furniture of Josef Frank does not fit the clean, strict, and functional design in which Masonite is a common feature. Perhaps the real challenge lies in using the last Masonite boards—the material of modernism—for Svenskt Tenn in order to challenge, in terms of material choice, the precious woods preferred by Josef Frank. In his opinion, the long legs of his furniture were important for allowing the eye to see both the floor and the wall behind the piece. This idea has been our inspiration when creating the new cabinets. There is also something alluring in investigating the way Josef Frank questioned the uniformity of modernism and was not afraid to utilise décor and patterns. He was a defender of pluralism and of embracing individual expression. In his opinion, the best thing about the age of machines was the possible freedom it entailed. He would also emphasise the importance of craftsmanship—a subject that seems as relevant today as it was then. All the human encounters we had at the Masonite factory were amazingly inspirational. Ever since we scattered those first flowers, we have kept returning to Rundvik. We wanted to showcase the people behind the production of the boards and put the place, the craftsmanship, and the industrial manufacturing processes in the spotlight. For the same reasons, it is also interesting in this context to mention another important collaboration, notably that of Estrid Ericson and Josef Frank, and how together they managed to create a functioning form of artistic expression. It is interesting that two people in collaboration can draw out aspects of one another that each, on their own, would not dare exhibit.

Figures 1–4: The Masonite factory was located in Rundvik, outside of Umeå. Photographs by Magnus Laupa.



Figures 5–8: Samples of perforated Masonite. Above, with the Masonite logotype. Photographs by Kjell B. Persson.

Figures 9–11: Masonite Cabinets with butterflies and flowers pressed into the Material. Folkform 2010. Photpgraphy by Emma Blonski.

Figure 12: The huge Masonite press. Photography by Magnus Laupa.

Figures 13: Bedside, Folkform 2022.
Photograph by Kjell B. Persson.

Figures 14–16: To the left, Masonite Cabinet With Stripes. Middle, Masonite Cabinet with Red Doors, Masonite from 1929 and 1950. Right, Masonite cabinet with 18 drawers, Folkform 2010-12. Photographs by Kjell B. Persson.

DISCUSSION

Forms of Re-presenting Craft Research

In this section, I discuss challenges in representing and communicating practice-led research in an academic context. How can we communicate knowledge and experience of form-giving, materials, and manufacturing?

From Renaissance to Bauhaus, there has always been design research (Borgdorff 2010), but knowledge production through design practice has not qualified as academic research in Sweden until recently. I believe that through practitioner-research within the academic context we can contribute to the creation of a multimodal language to communicate practice through developing dissemination methods.

Like London-based researcher and furniture designer David Gates (2013), I suggest that we should bring light to the everyday concerns of craftspeople of the field from the inside. Gates's research is drawing upon "small-story" research (Georgakopoulou 2007), which is an alternative approach to the grand canonical narratives. Swedish craft researcher and interior architect Andreas Nobel is one of the founders of the Swedish design group Uglycute. He is perhaps one of the most vocal critics of textualisation of design in the Swedish context. In his doctoral dissertation "A Dimmer Switch on the Enlightenment: Text, Form and Formgiving" (2014), Nobel argues that interdisciplinary attempts to integrate theory into practice often result in an increasingly strengthened position for traditional academic and text-based approaches at the expense of form and practical knowledge. Nobel explains that he is critical of the extent to which text-based knowledge production directs research within design professions (2014, 32). He argues that within these schools the educators have, before this new tendency of focusing on text-based work, developed important, efficient, and alternative languages and methods for knowledge that does not—and cannot—come in text form. Swedish ceramist Mårten Medbo, on the other hand, considers the idea that material constitutes its own language, with a unique set of communicative qualities distinct from those employed by text (see this anthology). In his published PhD thesis, "Clay-based Experience and Language-ness" (2016), Medbo considers the ways in which clay-based language can be understood, suggesting that materials such as clay, wood, and metal are both languages and examples of artistic materials (2016, 110). Through his own creative practice, Medbo seeks to communicate with the observer via clay, and to demonstrate that craft can function as a language practice.

In the case of my practice-led research conducted at Folkform, the theoretical positioning of the research work was formulated in retrospect. Responding to the requirement to position my research within the academic theoretical tradition, I found methods used in the social sciences and narrative research, such as ethnography and autobiographic narrative, and field studies that corresponded to my own process. My research also has some similarities to action research in the sense that it aims to transform and enhance practice. The theoretical point of departure is inspired by narrative research (Bruner 1991), where the small story becomes a way to capture knowledge. Within the academic field of practical knowledge, the experience is at the centre of attention. The methodological tradition of writing down events, such as memories, from one's professional life is also an established methodological approach (Ljungberg 2008).

The knowledge base that constitutes the actual making is often poorly communicated and overlooked in research when compared with the attention given to the artefact (Rosenqvist 2016). To bridge this gap, the first versions of my memory writing have often been formulated and published in exhibition catalogues (Holmquist 2017; 2019). This approach to novella writing was similar to the early writings by furniture artist Thomas Tempte in his book *Lilla Arbetets Ära* [*In Honour of Minor Work*] (1997), which was also a self-publication in connection with an exhibition in 1982. Through his short-story writing he reflects and communicates the experiences of furniture making, but he also interviews other practitioners, such as a boat builder. Like that of Tempte's, my own research explores practical collaborations with local workshops and factories and suggests that the designer should have a close relationship with production.

Part of this reflexive approach involves the researcher revisiting the design projects. In this case, within the field of material and furniture design, there is also use of narrative design and visual images of the production processes and the design of artefacts. Through the narrative method of writing and manufacturing Production Novellas, the project attempts to communicate knowledge of the design production process behind the objects, focusing on past industrial processes and craft techniques.

Reflections on the Production Novella

Through the Production Novellas it was possible to highlight some of the manufacturing traditions and old industrial processes in local contexts and craft techniques that were, in some cases, threatened with extinction. It was possible to communicate the spirit and history of the places where the artefacts were produced, how the products were made, and by whom. These elements are also key to the narrative of the furniture and objects that we designed and that are included in this research. A challenge with the format of the Production Novella is to integrate formats other than text-based communication, such as the haptic expression of the furniture, to share it with the research community. In a future scenario I would also like to include the physical materials of the furniture as part of the compositions creating the Production Novellas. However, because of the form for disseminating this anthology, no physical materials or furniture could be included in its material form. Some other limitations of this approach that I have experienced during my research is that the writing and visual material only represent fragments of memories from the design and manufacturing process. Since I have chosen to leave out parts of the process, there might be a risk of simplification or forgotten moments. Finally, the method is very time consuming and expensive since I bring a professional photographer on my journeys and because I aim for the images and texts included in the Novellas to have an "artistic expression" within themselves. The advantage of the approach is that I am sharing a unique insider's perspective on the design and manufacturing process that manufacturers and designers do not usually visualise. The Production Novellas are more than ethnographic notes since I am offering a creative visualisation and documentation tool for practice-led research which integrates textual and visual artistic narratives into craft and design research.

The texts are written from my situated position and knowledge based on experiences from manufacturing processes as a researcher-practitioner in a creative practice. The recollections are based on my own memories and include a selection of short episodes from the manufacturing process.

The Production Novellas in combination with the exhibition format become a way to share experiences from the processes behind the manufacturing of each piece. Through the Production Novellas, the intersections between craft and design and the presence of craft even in factories and large-scale production settings become visible.

While reading the Production Novellas, I also notice the importance of the designer being present at the site of manufacture, both as a source for inspiration in the form-giving process but also as a key to innovation, such as in the case with the Masonite board. Furthermore, the engagement builds trust and shares knowledge between the designer and the craftspeople. This might be a crucial factor in advancing the collaboration between the craftspeople and the designer and, in the best cases, creates stronger relationships with the manufacturer.

The approach of the craft-based design method of looking back in history and discovering old traditions of manufacture as an important tool in the design process (see Holmquist, Magnusson and Livholts 2019) is interesting to explore further, especially how the combinations of novel and traditional ways of manufacture in new exhibition contexts lead to new meaning for the audience.

From an insider's perspective of design, I notice that there are unexpected combinations of materials—a collage approach—guiding the design process. In the case of the industrial Masonite material, different types of Masonite fibreboards were combined in the same Masonite cabinet. In other furniture, thin flowers were pressed into the fibreboard to create a new expression.

In the case of the Masonite fibreboard, the initial experiments were carried out during the night, showing the critical element of time in relation to experimentation in manufacture. To innovate and develop traditional techniques of manufacture and old craft techniques, the designer and craftsperson need time to experiment in close collaboration with experts in the old craft or industrial processes.

The manufacturing narratives that I refer to as Production Novellas are a narrative process documentation method to communicate industrial heritage and collaborations with different craftspeople through my design work. While working as a designer at different locations producing furniture and other objects and reinventing old traditions of manufacture, I have captured some elements of the industrial processes and the use of technical tools and machines before the holders of the traditional skills and knowledge were lost, such as in the case of the last Masonite factory in Sweden.

CONCLUSION

The Production Novella presented in this chapter is a methodological contribution to communicate materiality and experiences from the co-creation during manufacturing practices at Folkform between the craftspeople and the designers. This form of practice-led research communication shares an inside perspective on the design and manufacturing process. The experiences from the design and manufacturing process were described in the form of short written memory fragments and photographs. In this chapter, they recall the manufacturing process of a new Masonite material and a series of Masonite furniture.

The Production Novellas as a narrative multimodal composition, where the processes of manufacturing the artefacts are visualised, could be a contribution not only to craft and design research but also to the field of Industrial Heritage studies.

The personal, subjective, emotional, and aesthetic qualities of the Production Novellas are an important part of the composition and documentation. By combining a research-through-design approach using the Production Novellas, I introduce the audience to the collaborative process between the craftspeople and the designer and the handcraft which goes on inside factories and large-scale production in Sweden. Through my Production Novellas, I wish to make local manufacturing cultures more visible. Hopefully I will inspire craft practitioners and academics to further develop narrative methods in craft research and to explore new, creative, practice-led strategies for an inside perspective in the making of knowledge.

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Birgitta Nordström is the main author of this chapter and she is writing from a firstperson perspective and from within her artistic process. Camilla Groth has co-authored the chapter by contextualizing and theorizing the processes and their meanings.

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The Role of the Weaver in the Encounter with Life and Death

By Birgitta Nordström and Camilla Groth

I weave ritual textiles for funerals, loss, and sorrow. Weaving in relation to death is a topic in myths, literature, and storytelling, where the weft, woven row by row, resonates with human life lived day by day. So does the ending, cutting the weave off the loom. The craft of weaving thus acts like a symbolic reference and a metaphor for life and time passing. For me, weaving is a way to produce works of art, but it is also a process of reflecting and as such it is a necessary part of my creative process. My weaving is a research practice in which questions of how we deal with death in today's society are concretely performed and tried out in practice where people encounter my textile art.

When somebody asks me if I'm not finished with this "death topic" soon, my response is: death is not a project, it can never be. Awareness of death is the ultimate level of being very alive. I guess it is ultimately about empathy. My heart and my mind open up when meeting a person in sorrow. Or when I think of a stillborn child. So, then, what role does weaving have in this process? The answer is that it's about the activation that weaving or any crafting allows while reflecting, while being occupied with something meaningful. Having something at hand and "doing" something can be a solution to helplessness, and a way to reach out to others. I guess we all feel, time to time, that words just aren't enough. We try to find them, express them, but they are only an attempt. The weaving, in contrast, is very material, is a matter that can be measured in time, and it can sometimes be a matter of honour. I weave for something that is larger than myself, for someone—even if that person sometimes doesn't weigh more than 600 grams.

To make up a bed, to swathe, and to enshroud are actions that are deeply associated with being human. A blanket becomes a first dwelling for the

Figure 1: Relatives to Britt-Marie Ivarsson are saying farewell by draping a funeral pall over the coffin right before the official act begins. Photograph by Birgitta Nordström.

newly born baby in its first meeting with material life. In acts of play, children might build a fort or a hideout by draping a blanket over a table and crawling into the shielded space inside. Woollen blankets can also allow survival in a crisis situation far from a protective home. In the encounter with death, textiles take on a different, often ritual meaning (see Figure 1). Through my creative practice, I investigate the ritual importance of these textiles and the different textile actions in relation to death.

The two different kinds of ritual textiles I weave are funeral palls and infant wrapping cloths. A funeral pall, shortly described, is a large blanket to be draped over the coffin in the burial ceremony. Infant wrapping cloths are small blankets, intended for children who have died during birth or in late-term miscarriages or abortions. The act of weaving these textiles has opened doors for me into spaces and contexts that I wouldn't necessarily have experienced otherwise. It has also opened up aspects of how material matters in life, and how making and using a material becomes a way for reflecting on these issues on a societal level.

What I would like to share in this chapter are reflections about the role these textiles play and how craft offers a way to help us comprehend the incomprehensible. Through reflecting on two different projects—first an artistic commission to weave funeral palls for a hospital viewing room and secondly an artistic research project involving weaving infant wrapping cloths for hospital birth wards—I share my thoughts on the making of the textiles. I also reflect on the different societal values and situations that are intervened through these two processes.

The two projects deal with how cloth is used for wrapping a person who has died, and they relate to existential questions about loss and grieving. Both processes begin with weaving, but they differ in one essential regard: funeral palls are commissioned works of art and the weaving here is part of the art production, while in the study for infant shrouds, the point of the handweaving, aside from creating new blankets, is also to study how they are conceived and received by the users—the nurses and parents. Both processes include reflective practice and artistic research.

I think of these projects as examples of how craft can be a source and mediator of empathy in society. When it comes to the research around infant wrapping cloths, the objective is to find out whether this special textile could improve maternity care in situations of loss. In the process of weaving for this purpose, I need to imagine the parents' trauma and find ways to improve their situation by small means. Similarly, in the weaving of the funeral pall, I need to foresee the experiences of the future viewers of the scenario in which they say their last goodbyes to their loved ones and make this moment as dignified as I possibly can.

In the studio, I work with the design, the materials, and the functional aspects of the cloth, analysing the softness and testing the shrinking percentage of the weft. I conduct all working moments a long time before these blankets are being draped over a deceased person or swaddled around a stillborn child. The dead body at that point is very abstract, but the reality of the thread and the loom is the opposite—very concrete. Sometimes it feels like working between two poles.

NARRATIVES AS RESEARCH DATA

Narrative reflections give insight into the creative practitioner's motivations and reasons for decision making. The creative process is seldom entirely staked out before manufacturing the artefact, but evolves along the process of handling materials while simultaneously reflecting on issues related to the topic under study (Candy and Edmonds 2018). In this process, thinking is making and making is thinking. The nature and properties of the materials play a vital part in the process, and the creative practitioner learns to sensorily evaluate these and to make choices on how to best use them.

Emotions and feelings related to the topic at hand, as well as rational and functional design requirements, steer the intuitive choice of suitable materials and techniques that best facilitate the desired results. The artefact is thus developed through repetitive trials and errors, through several iterative processes of searching for the right atmosphere or tactile quality until the final result is deemed satisfying. The many test pieces and trials, sketches and notes make up for the visible evidence of this creative process, but the reflective writing and diary notes reveal the reasons for the decision-making processes behind the material outcome (Mäkelä and Nimkulrat 2018). These written notes and narrative stories also give the backdrop to the reasons and motivations for continuing the search for the best possible way of handling the topic and meeting the challenge of turning an idea into an experience that can be conveyed to another person.

NARRATIVE DESCRIPTIONS THROUGH WORK STORIES

To better describe the context and situation of the making process and their experienced relevance, I use an autoethnographic and narrative form of writing in this chapter, a method often used in the field of artistic research (Livholts and Tamboukou 2015). Magnus Bärtås developed the method of a *work story* in his doctoral study in the field of arts. According to Bärtås (2013, 19), a "work story" can be "a short, dry description of a process, essentially a material specification for painting, or it can be a complex story in literary/essay form," all depending on what kind of art is being conducted and the role of the text in connection to the art.

A work story resembles a thick description that evolves from the artefact and the process of its conception. I write about the funeral palls I made for Södersjukhuset hospital and the infant wrapping cloth project as narrative work stories; including the situation I was in while making the artefacts, the people I encountered, the material conditions and process, as well as the reflections I made along the way. In contrast to a case description with a reflection *afterwards*, the work story *includes* the reflection within the narrative. This suits the artistic research mode in which the reflection happens during the process of making and in the flow of the whole situation.

THE FIRST PROJECT: FUNERAL PALLS

In this first work story, the process of starting up and conducting the creative process of weaving funeral palls is revisited. As I have many years of experience of similar artistic textile commissions for churches, it was not the first time I had been contacted in relation to the topic of funeral palls. However, the story is not limited to the making process but also shows how the experience of meeting death and the possibility of taking leave of loved ones is mediated by many circumstances that can be altered by proper attention to details and materials.

Work Story 1

Sometimes a sentence can fill your consciousness, serving as a recurring reminder or encouragement. Throughout the long process of weaving funeral palls for Södersjukhuset hospital, one thought kept repeating itself in my mind like a mantra: 2248 threads and someone is going to die.

2248 threads to warp, prepare for sleying, wind the warp onto the loom's back beam, thread the heddles, sley the reed, tie the warp to the front beam, and tie up the treadles. There is an implacability about the craft of weaving: one step at a time and each one in the right order, returning to each thread in the process, again and again. Only when everything is ready for the actual weaving can the individual threads be transformed into a warp that is ready in the loom.

The funeral palls are meant to be used for many viewings and these deceased people and their loved ones were allowed to imaginatively occupy my studio and my mind, as unknown quantities, through that repeated mantra. There were many metres of fabric to be weaved and fourteen different treadles to tramp for the draft, regardless; craft practice can from time to time be very monotonous. I needed that reminder of the people involved to make the task of weaving real and meaningful. Perhaps it was that—the mental repetition of an exact number of threads—which gave me something concrete to hold on to.

This art commission process first began when the artist Johan Ledung called me on the phone to ask whether I was interested in making a proposal *for two funeral palls for viewing rooms that were planned for the reconstruction of the Södersjukhuset hospital. Johan had been selected to submit a sketch proposal for the art and design of the viewing rooms. He had read an article about my artistic research on infant wrapping cloths (Blomberg 2015) and contacted me to ask whether I was interested in collaborating with him. Yes, I was very interested. The function of these funeral palls would be to cover a deceased person in preparation for a viewing. The purpose of the funeral palls I had woven previously had been to drape the textile over coffins during funeral rituals, but never directly over a body as this new project would entail.*

The first funeral palls I ever made, almost thirty years ago, were not intended to be used in actual funerals. Instead, I made them as a way of using art to explore and interpret the process of saying goodbye in the event of a death. The coffins I used for display were made of cardboard—a kind of prototype that was never meant to be used either. Now, so many years later, the objective is the opposite: it is in the act itself that the essential happens. The draping of a coffin with a funeral pall by a loved one is symbolically similar to making up a bed—an ordinary everyday gesture we are all familiar with. While there is nothing ordinary about a funeral, the act of draping the pall and symbolically preparing a bed for the departed can help us to come close to and to be present in the situation. It gives us something to act on in a helpless situation.

One day Johan Ledung called again to say that we had been awarded the commission. So, it was finally time for a visit to his studio and to see some of his paintings and sculptures for the hospital: I stood looking down over a wooden model of the rooms at a scale of 1:25. Specifications, sketches, and ideas were noted in pencil directly on the walls and floor of the model. Two viewing rooms, two adjacent waiting rooms, and an entrance. Two bathrooms, one cloakroom. Daylight openings. The first thing I noticed was some hovering dots that were painted on the transparent walls of glass that link together the waiting room and the viewing room. Wood shimmering in the model. Did he paint the whole thing with tempera? I don't think I've ever seen a finer model. Tiny suggestions of framed paintings hung on the walls, perhaps of trees with branches, or an imaginary landscape. The walls and floor of the model were fitted together with great precision, while the sketchy pencil notations were scrawled directly on the model. There is always a tension between the intimated and the exact. In both viewing rooms there were blocks that, in this context, represented mortuary cots. I've seen gurneys like this before, with big wheels and a metal stretcher that can be slid into a refrigerated storage compartment in the morgue.

We agree that I will make use of lighter tones that correspond to the oak veneer on the walls. "But avoid the colour of a corpse," the staff advises. I ask what that looks like but never get a consistent answer. The dead people I have seen have all had different hues of colour and colourlessness. So, I start sketching out a dark, contrasting colour for the inside/underside of the palls. The pall will be turned down to show the face of the departed, and if I weave brighter tones for the top side then the underside can be a contrasting colour next to the face. I have brought with me a colour swatch Johan gave me from one of the intended painted dots for the glass walls. It is painted with an English red pigment, perhaps mixed with a sienna tone (Figure 2). In the rooms, this red colour together with other intense hues will provide accents to an otherwise subdued colour scheme.

This is how Johan Ledung describes his visions for these spaces: "The materials used should as far as possible show their own authentic character and accommodate traces of life. The different parts speak different languages in order to create a broad, inclusive feeling. The style is organically alive, growing—perhaps even unfinished" (see also the Södersjukhuset art fact sheet 2017).

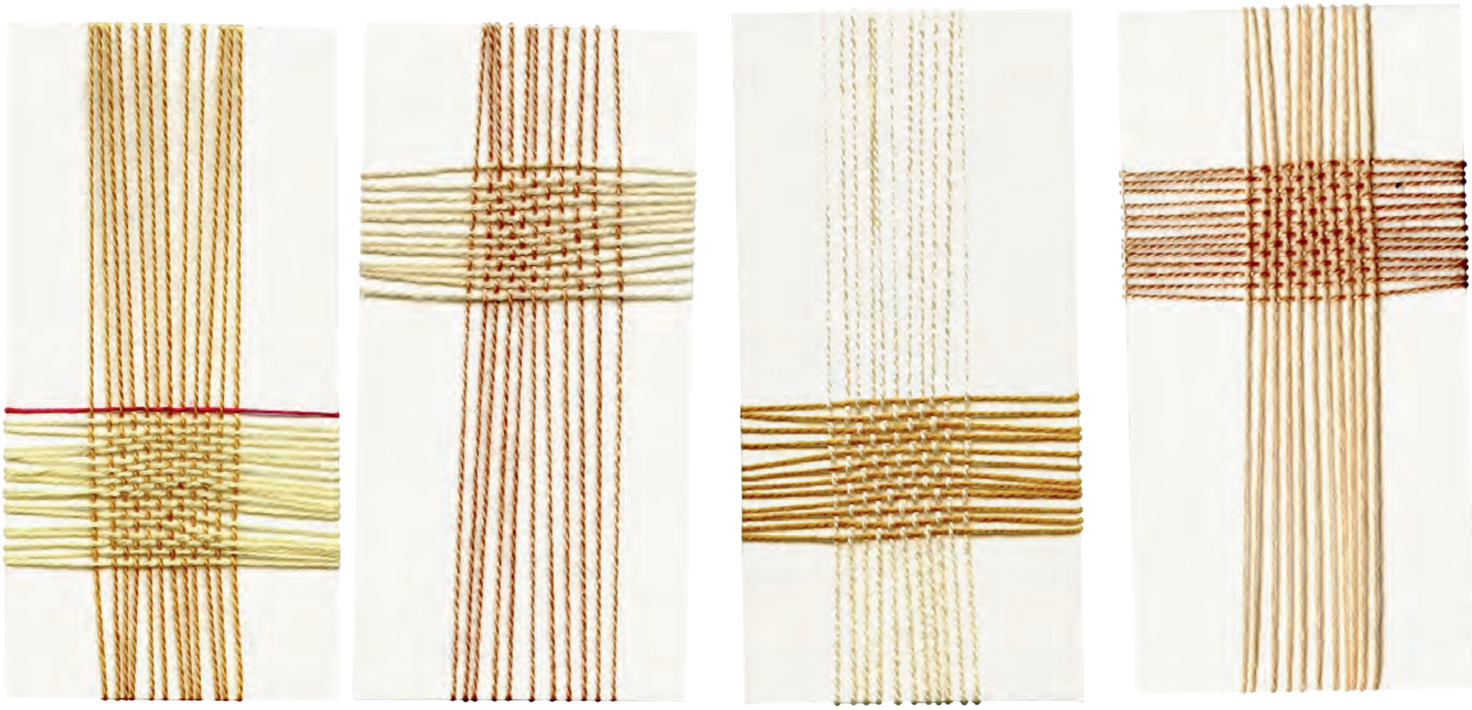
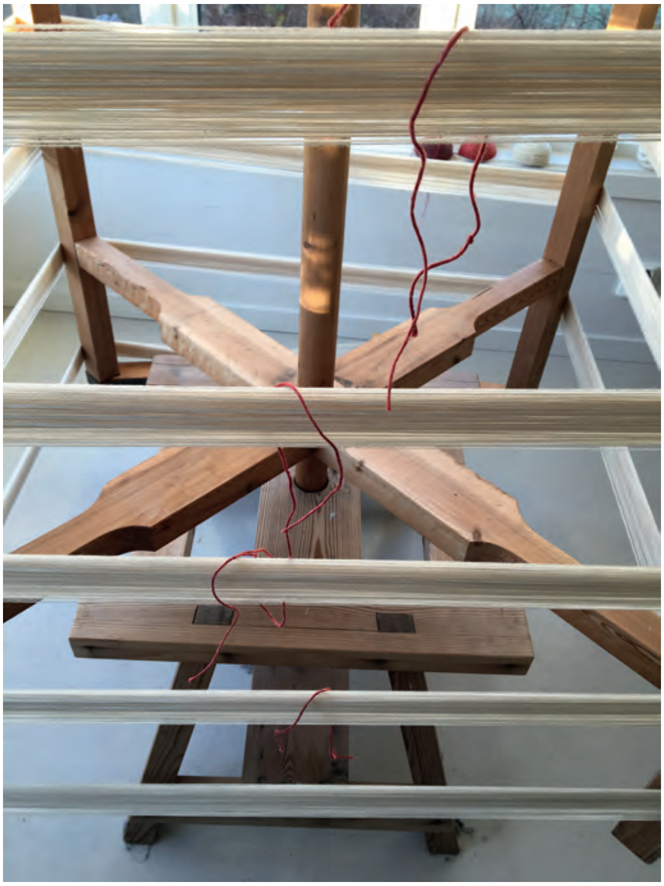


Figure 2: Test pieces for the funeral pall.
Photographs by Birgitta Nordström.

The great challenge in terms of craftsmanship in the work was how I would be able to weave the palls with the texture and lightness of a soft blanket that follows the contours of the body and yet that can tolerate a lot of handling and hot laundering at sixty degrees. The practical handling of these very large cloths, which are to cover mortuary cots, bodies, and possibly also coffins, constitutes an essential problem for the design. I didn't want the pall to seem heavy on the body, either visually for those attending the viewing or for those who prepare the body for the viewing. For earlier funeral palls I have used a double weave technique with one layer of wool and cotton/linen in the other. When the weaving is finished, and after I have cut it down from the loom, it is possible to shrink the wool in the underlying layer by felting it in a washing machine. Working in this way creates a visual movement in the weave that is visible to the eye and a texture that is pliant to the hand. And the resulting pall is also lightweight (Figure 3).

I wanted to use a double weave technique this time too, but using wool would be impossible because of the laundering requirements. Wool would continue to felt and shrink the cloth further every time it was washed. Instead I tried polyester in the top layer and cotton in the bottom layer. By stretching the cotton warp much tighter than the polyester warp, it would shrink much more than the polyester once it was cut down from the loom and laundered. That would allow me to achieve the desired texture.

I use widely spaced binding points to connect the top and bottom warps of the double weave, forming air pockets between the two layers. At these binding points the warp yarns change places—the weft for the top warp also binds a number of warp yarns from the bottom layer, and it can look like a little tacking stitch. Sometimes when I think about the palls and what they do in these spaces and in the circumstance in which they are used, it's also about a kind of binding—a point of contact between the living and the dead. A binding together, tying



Figures 3-5: The processof making and a close up detail of the funeral pall. Photographs by Birgitta Nordström.

Figure 6: The final visualisation in one of the viewing rooms at Södersjukhuset. Photographs by Birgitta Nordström.

Figures 7-9: The entrance to the viewing rooms during construction of the hospital. Photographs by Birgitta Nordström.

down, but also a release of living bonds. A new relationship goes into effect when death comes. It is never so that everything just ends; death is also the beginning of something else—an afterward. The pall is there in the gap between the two.

*Four months after the opening of Södersjukhuset hospital's new viewing rooms, I paid it a visit as part of my general site-specific research on the topic. When I have found my way down to the new temporary entrance, I am confronted with a scene of Orwellian dimensions. The hospital is still a construction site, and instead of entering through a garden as the plans intend, a kind of dystopian antechamber has been erected for visitors—I'm directed to go through a grey door and into a shipping container that has been plopped down next to the high façade. A plastic-wrapped sign with the words "*rum för avsked*" ("viewing room") is mounted to the temporary wall (Figure 4). The details of this sequence are going to be etched into the memory of every person who is shunted into and out of this insensitive passage to get to the viewing room and make their farewells. And I wonder, how many more months is it going to be like this? "It is abysmal," says the autopsy technician Carina Kroon as she opens the grey door and guides me through.*

We talk about bedding, about how she prepares the body for viewing. Carina Kroon says:

"I try to prepare the body as though it were me that was coming to say goodbye. First, I turn down the cover and then fold it back so the border is visible. But there are times when you can't allow the face to be visible. In that case we use a face cloth and instead maybe we can show a hand. That can be enough. The important thing is the recognition."

The funeral pall, which also hides the stainless steel of the stretcher, covers the body in the sense of wrapping it up, but at the same time it uncovers it to display the departed. "It must be dignified and lovely," says Kroon, and through her experiences I understand more about the significance of the bedding. "It shouldn't be like when I said goodbye to a relative at another hospital," she continues. "There they used the county council's orange hospital blanket, which covered the body but not the stainless-steel stretcher and the gurney beneath it. That's what it was like here too when I started

Figures 10-12: One of the funeral palls in place. Warp and a close up detail of the other funeral pall. Photographs 10 and 12 by Per Mannberg, and 11 by Birgitta Nordström.

working here five years ago. I got a little money to have a curtain firm sew up a blue velvet pall. But now we have yours!"

I walk around in the room where Johan's paintings now hang on the walls. For me they suggest landscapes from some other place. Or do they express a mental state? I sit down on a chair to test it; the materials are wood and leather and it is comfortable to sit on. But it's missing signs of people. It smells new, it's cold, there's no patina yet.

When I visit the meditation room of the hospital church later that day, I observe a little white rocking chair, and it makes me wonder if perhaps there ought to be a children's corner in the new viewing rooms too? Because of course there will be children saying goodbye too, won't there? And why will visitors not be allowed to light candles? I know it's because of safety regulations in new buildings. But candle lighting is perhaps the simplest ritual act we're able to do in some instances. It holds a lot of meaning.

The last place to visit on this day is a hospital meditation room, which lies adjacent to the Sachs Children's and Youth Hospital. Here, everything is well used—candlewax has spotted the floor over many years and the sofa is a bit broken. The room is dimly lit and has no daylight openings. In one way, we might say that pain, sickness, grief, and the need for consolation inhabit the walls of this room. There is also a wicker cradle for use when an infant has died. I stand before it and think about how it is thanks to my research on infant wrapping cloths that I've been commissioned to weave funeral palls for this hospital, and that it is the funeral palls I wove even earlier that paved the way for my research. There has been a cross-fertilisation throughout the process.

Provisional spaces, such as a blanket that becomes a fort, a wicker cradle, a coffin, a stainless-steel stretcher, a refrigeration room, an architectural model, a shipping container, a viewing room, a room for saying goodbye, and a hospital chapel—all these form a backdrop for my research process. I make associations, make visits, and think. The rooms and the objects become a meaning-laden chain for both art and research. When I think of the funeral pall we use to cover the coffin, or when we drape the funeral pall over the dead in the viewing room, I *realise that these are actions to create a protective, provisional space. Death needs a space of its own.*

And sometimes, I think, death needs a blanket of its own too. In fact, I come close to the essence of my research and my art practice writing this sentence. Not an ordinary sheet to be used, covering the deceased body; instead a textile, handwoven especially for the viewing ritual and the design of the room. Woven with its defined woven edges, weft with variation and traces of the hand, this pall is helping to dignify the room and the ritual. Craft, through its time-consuming and physical practice, makes time visible in this space. It might be pretentious to argue that this is what craft does in this context, but I can't find any better words. But when it comes to the maker, what does this work do? Johan Ledung and I often spoke about it. And we agreed upon one thing—it makes you humble.

THE SECOND PROJECT: INFANT WRAPPING CLOTHS

In the next section, the process of developing artistic research in the hospital environment and in relation to weaving these blankets is presented. The research process involves several stages: first some exploratory weaving to find a tactile expression in cloth by experimenting with weaving techniques and materials. This study led to eighteen handwoven blankets (Nordström and Davidsson 2011) that were shown in exhibitions and seminars. An important precondition was that it should be possible for people to touch and feel the blankets. During this period, important contacts were established with parents who had lost newborn children, and also with healthcare providers and the hospital church clergy. When you're holding an infant wrapping cloth in your hands, there's a lot you can talk about.

In a later study for my licentiate degree, entitled "In a Room of Rites—Cloth Meeting Human," the work deepened through a new exploratory weaving process, but this time it was aimed at industrial production (Nordström 2016) in order to produce more shrouds for several hospitals that took these in use in their birth wards.

Later, a research team was formed around the topic, with the primary objective of studying the need for infant wrapping cloth for children and foetuses that have died in pregnancy or at birth. The secondary objective was to study the design of the shroud in terms of size and tactility. This was done by trying out handwoven prototypes made by the weaving research group. During the course of the study, a total of five maternity wards and one gynaecological ward participated.

The blankets were distributed to the wards that participated in the study, and it was the midwives who determined when it was appropriate to offer the parents a blanket. The study interacted with the healthcare providers, never directly with the parents, and we never had access to any patient records. For every event in which one or more blankets were used, the staff filled out a questionnaire. The questions dealt with when and how the blankets were used, and whether they helped the staff if there was a need. These were followed by questions about the design of the blankets.

The study on infant wrapping cloths is systematically organised, with a questionnaire, delimitations, and identification of effect variables that lead to clearly observable research data that can be presented in the form of diagrams and tables. It is a long way from the language and knowledge field, methods, or expressions of art. But the clinical study is being conducted in dialogue with an artistic

Figure 13: Examples of the first handwoven wrapping cloths in 2010. Photograph by Peder Hildor.

weaving process in which artistic research questions are being asked and reflected upon. The narrative work story presented next shows some of the processes, emotions, and reflections encountered and lived through in the course of the handweaving.

Work Story 2

> *The idea of weaving infant wrapping cloths was born after an Arts Health conference in Australia. I was invited to lecture on funeral palls. When a doctor working in neonatal care heard me talk and touched the pall I had brought with me, she expressed a spontaneous desire for a much smaller blanket to use in meetings with parents who go through the trauma of losing a child. As she put it, "words just aren't enough." Her wish stayed with me, and when, years later, I had the opportunity to do an artistic development project, this memory became my point of departure.*
>
> *In the beginning I often felt a great insecurity that I, with my artistic curiosity, would insensitively step into a trauma situation for parents that have experienced losing a child. The solution for me was to frequently open up the process by exhibiting the first weaves in public exhibitions and through this process get feedback from the audience. So, before the blankets finally reached the hospitals, they were being activated and discussed in these exhibition rooms. The response was immediate and very encouraging. These exhibitions contributed to my field studies into loss, memory, and sorrow. More importantly, the response released my insecurity and encouraged me to continue this line of research. I realised that I had come across something really important that could be enlightened and developed by a craft research process. By doing this, I could also bring about and point to the topic on a societal level through the public exhibitions.*
>
> *Weaving the funeral palls is challenging because of the large size and the special demands of the textile, to be draped, folded, and unfolded over and over again. The challenge with the infant shroud is also about size—not of the textile, but of the very small body.*
>
> *The unknown. I weave for a stillborn child or a very small foetus, miscarriage or aborted. I think of the wrapping, the holding, the viewing. I think of the delicacy. I think of all parents that have to greet and part with their child at the very same moment. The first wish from the doctor in Australia has carried me a long way. I keep on answering through weaving.*
>
> *Telling is about giving and receiving. It is instant. It happens in real time. I told a woman I know about the weaving, the textile, the material itself, the human need to wrap a newborn almost instinctively, otherwise the child might die. The wrapping of the deceased is the same activity, but with a different purpose, I said. And she, in return, told me about an experience she had kept quiet about for many years. She had a miscarriage in an early stage of pregnancy. She saw the very small body in the lavatory and just couldn't simply flush it away, realising this would be an awful memory. So, she collected the tiny body and laid it upon a bed of unspun cotton that she had made and placed in a large box for matches. She closed the lid and didn't know what to do next. She went to the hospital and left the box there. "Textile and death are important matters," she said.*
>
> *Wool, cotton, linen, silk.*
> *Blue, red, grey. Or white. Yes, white.*
>
> *I can't think of death in any other colour. I know it is a personal aesthetic preference, but I trust it. Almost white, a neutral blanket visually, but with a tactile texture. An "invisible" textile, supporting the child, supporting the situation. The child is to be remembered, not the blanket.*
>
> *Later in my research, entitled "In a Room of Rites—Cloth Meeting Human," this research carried on through a new weaving process (Nordström 2016).*

Figure 14: Industrially woven fabric sewn into wrapping cloths. Photograph by Carl Ander.

I wanted the infant shrouds to be tested in hospitals and the exclusivity of handweaving was not a viable road at this time; what was needed now was an industrially made textile material that would make it possible to manufacture a larger number of blankets and which would also be a simple way to make a variety of sizes.

The very first handwoven blankets were made with an intention to weave the most beautiful and tactile blankets I was able to, but the perspective now needed to be broader. Midwives have since guided me on the specific needs that the blanket must satisfy: not too soft, the textile must provide some of the resilience the dead body has lost. They have told me of the very, very fragile skin. That the holding capacity in the textile itself was important, together with the ability to absorb moisture. Wool would maybe damage the skin of the child even more. The solution was to add a little sheet of the finest cotton satin nearest to the child.

I chose unbleached cotton and wool. Cotton is soft, wool more rigid, and both materials have a good ability to absorb moisture. And wool is warm to the touch—it doesn't warm a dead body, of course, but for the parent holding a cold child in his or her lap, the perception of warmth means a great deal. One memory from the very beginning was when a woman said: "I lost my son seventeen years ago, and I still wonder whether he is freezing, so weave and weave them warm."

After the handweaving and the development of a viable prototype was finished, the industrial manufacturing of the design was done at Ludvig

Svensson's factory in Kinna, Sweden. They wove 300 metres of textile in just over twenty-four hours. The role of the weaver in this situation was turned into watching metre after metre of textiles being woven, with a feeling of wonder, fear, and a sense of being out of control. No hands to touch the material, no fine adjustments allowed. Afterwards it felt like the fabric rolls invaded my studio and I started to cut, unravel the edges, sew, wash and shrink to get the texture. 300 metres was far too much material for the study, but as these blankets were to be shown at exhibitions too, I needed numbers to represent the loss of many children.

Slowly but surely the format of the study took shape and everything was documented in a study protocol. The primary objective was to study, in a hospital setting, the need for infant wrapping cloths for children and foetuses that die in pregnancy or at birth. The secondary objective was to study the design of the blankets in terms of size and tactility. A dialogue was established with the regional office of ethical standards, which provided an advisory statement. This period felt like learning a new language, far away from my comfort zone in the studio. Parallel with all preparations, one difficult and completely essential part remained before the study could begin. I only had agreement with one hospital and I wanted the study to be conducted in at least three different wards. It was hard to get a positive response. Artistic research? Weaving? Blankets? When I managed to get beyond the first contact and was invited to come and talk, and to show the blankets, the blankets themselves solved the situation.

Blankets for stillbirths was my initial focus but during preparations for the study I received requests from midwives for even smaller blankets for late-term miscarriages and abortions—no larger than 45 x 45 cm. I realised that the fabric I had produced for the blankets was going to be too rough for a very small body. What should I do? I recalled the power of the first study, of weaving my way, blanket after blanket, into a deeper understanding. The time invested in handweaving had created space for lots of ideas and existential questions. What if I invited colleagues and students to form a weaving research group (see also Hemmings 2018, 67)?

Until then, I had been working on my own, but for the next step, to prepare for the clinical study, I needed various kind of expertise. A research team was formed with representatives of aesthetic, methodological, clinical, and artistic perspectives. Throughout the study period, we have woven, hemmed, and felted more than 70 blankets, most of which we've donated to hospitals. We were eight members when we started, but the group has since added two more weavers.

We have woven in a double weave technique with merino wool in the warp of the bottom layer and mercerized cotton in the top layer. The warp consists of 576 threads in each layer threaded on 16 shafts. We used one loom with digital thread control that makes it possible to change the draft and points of binding from one blanket to another. Each weaver has chosen their own weft and draft themselves. The loom became our meeting place and our textile production was noted in a journal, documenting each new blanket.

We have striven to achieve a fragile feeling for these blankets, barely just holding together. The balancing between softness and firmness that was necessary with the larger blankets is not important with wrapping shrouds for foetuses. Instead they need to be designed for shrouding a very delicate body and for parents to be able to receive, to look, and to say goodbye. In cases when there is physical deformity of the foetus, the blanket serves as a protective sheath. Sometimes it was hard to weave these blankets, or rather, afterwards, in all the finishing handlings before the blanket was ready to fold with the little sheet inside; all these different steps developed the thought of the very absent body. I had to stay with the thought of the child and the loss. The slow process of doing crafts helps to stay focused.

Figures 15: Gunnel Sthen, member of the weaving research group in the fibre workshop at HDK-Valand. Photograph by Peder Hildor.

THE MEANING OF CRAFT

In my work as an artist, I see craft as an artistic method. Craft is a means for making art and for conveying experiences that travel further than the materials that mediate them. By choosing to write about both an artistic commission and a delimited research study, I have wanted to demonstrate how interwoven weaving and research are. It's not just because the two activities are united by a common theme; this interweaving applies to practitioners from any field who conduct research on and through their own practice. The process of thinking and making unite in the act of thinking through making.

Changing Views of Dealing with Death

The study on infant wrapping cloths is being conducted during a time that reveals a changing view of death in relation to newborns, as seen from both clinical and existential perspectives. While there has been a culture of silence around the death of children, today we emphasise the importance of bonding with the dead child (Bendt 2017). After the study was concluded, I interviewed some of the midwives and nursing aides who participated in the study, and from one of these interviews I remember one sentence in particular: "I want to do the best I can for these parents—the worst has happened, you know" (Nordström 2019, 59–61).

Parents are encouraged to *see* the child, to be close, to hold the child, and to say goodbye. Many of those who had lost a child previously but that I met during the course of the study describe a different time when the approach was the opposite: the child was taken away, and the attitude and message were intentionally conveyed to the parents that it was not appropriate to look at the dead child—that it was better to look ahead and move on instead.

In her book *När möte blir avsked* (*When Meeting Is Parting*), the professor and midwife Ingela Rådestad (1988) gives an account of her own experience of giving birth to a stillborn baby in 1981, and of how poorly she was treated then. One example of her contributions to research in the field is the Cubitus Baby (www.stillbirth.se), a cooling cot for stillborn babies. There is now a Cubitus Baby in every maternity ward in Sweden, and our blankets are tested in/together with this device in those wards where the study was conducted.

Similarly, the parting of the elderly is in a process of change. As more and more people in Sweden choose to be cremated directly rather than having a funeral ritual with the coffin before the cremation, these rooms are only going to become more significant in the grieving process. Will a new ritual be created for loved ones in the viewing room because the viewing won't be followed by a burial ceremony? Holding a ceremony with the urn following cremation is becoming more common. Though it was once very rare in Sweden, urn ceremonies are now held in over 6% of deaths according to statistics from the National Funeral Directors Association (Hagberg and Lindberg 2018).

Figures 16: (Opposite page) SaraMy Bernetoft, member of the weaving research group in the fibre workshop at HDK-Valand. Photograph by Peder Hildor

Crafted Materials Can Mediate Dignity and Play a Large Role in Comforting

From the study on the infant shrouds there are both quantitative and qualitative research data to analyse from fifty-six occasions when infant shrouds were used. For each question on the questionnaire, the healthcare providers have been given space to add their own comments. If I were to mention one thing from all the material we have gathered, it would be a word that emerges when midwives and assistant nurses write these personal comments: the blankets make it more *dignified.*

The word *dignity* was also present in my research for the funeral palls: *"It must be dignified and lovely"* said the autopsy technician, and yes there is no other way, but what is it that makes the situation dignified? The viewing rooms and the objects in them can, for some people, become enduring bodily memories. I recently spoke with a friend who had lost her son in a car crash. We spoke about the room where she went to take leave of her son, and realised how precise some of her visual memories of that event were. She recalls that the steel piping of the chair she had to sit in was cold and chafed her skin, and that there was no daylight in the room, and there was nothing to rest her head on.... Those kinds of memories can remain permanently clear, while it's more difficult to remember the most painful: the dead body. And this is the delicate situation that provides the context for the art in these rooms. The negative experiences told by the people I met show how material qualities such as cold stainless-steel chairs without headrests or provisional cheap materials, insensitive colours such as the orange of the county council's hospital blanket, and flimsy last-minute solutions such as the entry to the viewing room can make the situation awkward and disrespectful. Craftmanship and proper attention

Figure 17: Terese Molin is hanging handwoven blankets in the smallest size drying in the air, after the felting/washing process. Photograph by Birgitta Nordström.

to materials and sensitivity to the many unconscious but emotionally triggered physical experiences such as the warmth of a material that the space affords have the potential to make all the difference.

Meaningfulness in the Hardship of Making

The artistic process of weaving blankets, each one with its own feeling, is more meaningful than just weaving many new blankets for a study. It takes about three and a half hours to handweave a little infant wrapping cloth—time for enough reflection that gives you the force you need to drive the work onward. The weaving is not generally a therapeutic process for me, but our weaving research group includes two weavers who have lost children at birth. That has helped the rest of us to never lose sight of the objective. The study has been anchored by their experiences.

The study at the birth ward was monitored through recurring visits to the hospitals. I passed out blankets of different sizes with accompanying sheets and gathered up the questionnaires. There were many small craft tasks to do in preparation for these visits. Cutting and sewing new blankets from the industrially woven fabric, felting them, and if any handwoven blankets were ready, doing the same with them. Dry, press, fold, sew a little sheet of cotton satin—everyday textile actions that in this context took on a momentous gravity.

The smallest blankets, each one quite distinct from the others, have been a source of conversation and sometimes wonderment when I visited the maternity wards included in the study. One midwife says, "What blankets do you have with you today? I shouldn't be happy to see you—of course I know why you come here, because the blanket supply needs to be replenished—but I am anyway."

The knowledge of it all being meaningful made the hard and slow, sometimes tedious work bearable. This was also the case in the weaving of the funeral palls, as I was reciting the numbers of threads as a mantra to keep going. A man that once wanted to use one of my funeral palls for his wife's funeral expressed that it was comforting to know that I was in the studio, weaving that pall for his wife. And I didn't tell him about all the monotonous hours and my aching shoulders. These different perspectives are inevitable parts of the same story.

Material Choices Mediate Empathy

While the textiles woven in these examples are not going to be felt by the wearer, they mediate the care, emotions, and feelings of the mourners. The textiles have both a pragmatic, functional role to play as they shield or show aspects of the situation. The wrapping cloth protect the fragile skin of the child, and the pall function as a bedding for the deceased person at the moment of last goodbyes. The textile qualities also work in the background, on an embodied level, as the warmth of the wool that mediates the experience of life or the action of wrapping as an action of protecting. These tactile qualities might not be consciously understood but rather unconsciously felt.

The weaver mediates the situation of farewell for the participants, well before the event occurs, by orchestrating the fundamental prerequisites for the event via material choices and conscious decisions. This is exemplified with the statement: *I didn't want the pall to seem heavy on the body, either visually for those attending the viewing or for those who prepare the body for the viewing.* To be able to empathise with the users of the textiles in such depth requires time spent reflecting on these issues deeply and with a sensitivity for details and a true feeling for the situation at hand. Craft is not a speedy process; instead, craft practice allows for deep and prolonged reflection and sensitivity to materials and their properties that make the difference in quality and purpose. In this way, craftmanship has the potential to mediate empathy through materials and reflection.

It is very hard to imagine the pain that parents experience, or to understand the difficulty of the situation in which the medical staff work. The blankets were given to the parents and followed the child, either for a short period during care taking or as a shrouding blanket for cremation. Every single blanket is destinated only for one loss, no reuse. Some parents kept the shrouds as a memory.

One midwife writes in our questionnaire about a father who lovingly swaddles his child in preparation for its transfer to the morgue. When I read about that, I wonder if he ever even saw the blanket. I expect that he only had eyes for his child, and that's how it should be. The infant wrapping cloth is never the focus of attention, but only makes possible a ritual action that becomes part of the construction of memories surrounding the deceased child. It is a memorial act to preserve, an act to be remembered with the hands as well as the eyes.

Afterwards, when reading the questionnaire from the study, I think of the most frequent words used by the midwives: shrouding, softness, firmness, dignity, ritual, sorrow, trauma, empathy, absorbance, liquid, loss. It is all there. This is what my research is about.

CRAFT AS A CHANNEL FOR REFLECTION—THROUGH ACTION

In this chapter I wanted to share reflections about the roles these textiles play and how craft offers a way to help us comprehend the incomprehensible. I believe that my research on infant wrapping cloth and my artistic work with funeral palls demonstrates how craft has an unquestionable role to play in society. Weaving a fabric and cutting it off the loom is a grand human narrative about life and death, but that narrative is also extremely tangible and turns into a factual situation when I am working on the loom.

In addition to reflecting on the human situations that I encounter in these processes, the loom also forces me to think of the logic and concrete reality of the craft at hand. Threads must be sorted, grouped, and stretched. Weft and warp are interlaced, one centimetre at a time. And it proceeds this way until it is time to cut the weaving off the loom, and then it is over. But when the infant wrapping cloths are used in the wards, they become part of this grand narrative again. It is almost unbearable to concretely imagine the dead child, but the act of swaddling is something we can think about and understand. Something we can do. There is comfort in a blanket, and in the act of wrapping a body in one. How unbearable is the thought of leaving our loved ones helplessly unshielded at that moment when we have to part from them? Even the thought of being able to do something like that may offer some comfort. -

Sorrow Turns into Social Making and Reflecting

Recently I wove a new funeral pall. That weaving was very different. Both my parents were very ill. I knew it was for them I wove. Now my father has passed away and the pall was used during his funeral which was a funeral held during the Covid pandemic, in the Summer of 2020. Only the closest family was sitting around the coffin. And we all spoke to him—or about him—sitting there. I told the others that the picnic blanket which he used to have in the backseat of his car was now placed around his body, and that I thought of the funeral pall we covered the coffin with being something for us, something speechless to be active with. To see, to touch, to make up his final bed with. Afterwards, what touched me deeply was the undraping before carrying out his coffin to the waiting car. The textile is fundamental and essential as an object through which to tell the big life story of beginning and ending; being at the theatre as a curtain, or in life as a swaddling blanket at the beginning and as a shroud at the end. Receive and depart.

When death occurs, we need to visualise the parting, whether within a formal ritual or as an instant action. In that sense I believe my craft navigates in the direction of gravity. For me, this specific kind of weaving is about gravitation. I write this thought down now, in this very instant. I have to think, is it so? Is that feeling my fuel and my force? If so, in order to answer the question about crafts' potential contribution to society, I play with the different tasks we have, whether being an astronaut, a baker, a builder, or a weaver, weaving textiles for moments of sorrow.

Yes, for the moment I embrace the idea of gravitation.

And to turn helplessness into action, the act of making comes to the rescue. A new fabric for the infant shrouds, made at the factory, is almost finished. This large roll of textiles is now being placed in the corner of a gallery space in Stockholm as I write these lines. When the exhibition *Songs of Sorrow* opens, this part of the gallery will be transformed into a small sewing factory. I will be there from time to time, colleagues and friends are also coming to assist. We will be inviting visitors to follow us in the steps of making small shrouds out of the roll of textile one by one. The first task will be to decide whether to sew a blanket of 90 x 90 cm for a fully delivered child, born in week 40, or 70 x 70 cm for babies born around week 30. The smallest size, 45 x 45 cm, is designated for foetuses.

I know from earlier experience that this action of choosing a size really evokes feelings of empathy and reflection around the intended purpose of the shroud. We all have someone to think of: a sister that has lost a child, a brother that was meant to be, an invisible child, taken away from the mother in earlier times… the process of making does this, for a small moment of time; for maybe an hour it releases the thought, but not entirely in the sense of therapy, just as a trigger of reflection. This act of actual making is also proactive. Someone will be needing the blanket at a hospital in the near future. In this activity of crafting together, a mixture of memory, action, and empathy is hidden. The textile will in the end be cremated to ashes but the memory of making might stay alive in the hearts of the people who live on.

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On Wheel-Throwing and Meaning

By Mårten Medbo

INTRODUCTION

How a Doubt was Turned into an Obsession

I am a ceramicist and in my practice wheel-throwing has always had a special place. It is the individual craft technique that I have devoted most time to and therefore, perhaps, have mastered the best. When I started my ceramic career as an apprentice in a pottery, wheel-throwing was seen, both by me and the other potters in the pottery, as the very fundament in the ceramic work. It is embedded in the pottery tradition, and wheel-throwing was for a long time one of the most effective ways of manufacturing pots. Later, as a contemporary ceramist, I have moved away from the pottery tradition and at the same time have started to doubt the relevance of wheel-throwing as a way (for me) to create artistic expressions. Despite my doubts, I have kept on throwing but for a long period I did not show what I made on the potter's wheel publicly. Lately, however, my doubts have ceased and throwing once again has a central place in my practice. I would say that my interest right now could be described as a kind of obsession. Much of my previous scepticism disappeared when I was given the opportunity as a PhD student in crafts to reflect upon my own professional experience. It helped me to understand the sort of doubts I had and it also made it easier to see how the craft skills I possessed could come in to use in relationship to my ambitions as a contemporary ceramist (Medbo 2016).

After finishing my PhD studies (Medbo 2016), I gave myself the task to explore the artistic potential of wheel-throwing in a more active and reflective way than before. I set up a framework for the work: the prerequisite was that throwing would be the main shaping technique and that the particular possibilities of throwing would be readable in

Figure 1: A clay balloon being made, in part with the help of a thin metal sheet. Photographs by Hanna Stahle.

the finished works. I delimited myself to exploring wheel-throwing from both a technical and an artistic point of view. During a rather long period of my career lasting about ten years, when I didn't show any wheel-thrown work publicly, I still experimented a lot with thrown forms. Among other things I produced air-filled clay balls of various sizes—like clay balloons. The clay balloons had special properties that I could experiment with. They were formable in a special way. The air made it possible to continue working with shapes taken directly from the potter's wheel as it helped the clay to remain very 'plastic'. The enclosed air prevented them from collapsing. Normally, a freshly thrown object is very fragile and is endangered by any handling. The clay-balloons, therefore, did not just resemble balloons visually; they shared the properties of a balloon too. If many such clay forms were put together into a larger structure, they could be made to adapt to each other in a particular way. I saw artistic potential in the wheel-thrown work and this way of working. One consequence of the method is that I have to spend long times of repetitive work at the potter's wheel to produce all the clay balloons needed. The work can be hard on the body and can be described as very monotonous.

The interesting thing in this context is that the difficulties have no deterring effect on me. Rather the opposite: something draws me to the potter's wheel and the more time I can give myself at the wheel the better. I mentioned earlier that I was unable to quit throwing even though at the time I could not see the potential to create artistic expression that met my standard. If I, as a ceramicist, do not see the artistic possibilities in a technique, must it not then be regarded as irrational to continue? Why did I still continue to throw?

Meaning

My research is heavily influenced by the field of practical knowledge and the use of experience writing. Within this research field, professional experience is placed at the centre and forms the basis for in-depth reflection on one's own professional practice and the conditions that surround it (Josefson 1991; Nergård et al. 2005; Ljungberg 2008; Gunnarsson 2019). Typically a retelling of some episode of significance from the practitioner's professional life would function as the hub of which the reflection starts and then revolves. Presented in this anthology, Birgitta Nordström uses work stories of weaving as a means to investigate the ritual importance of textiles and their uses in relation to death, and Anna Holmqvist develops the Production Novella to elicit the industrial heritage of Masonite and its potential in furniture design. The opening story about my concerns about wheel-throwing has a similar function in this text. What is it about the wheel-throwing that attracts, as it seems, beyond sense? These wonders will be the theme for this chapter and the starting point for a reflection on the meaning in and of craft in general and wheel-throwing in particular.

Figure 2: (Previous page) Clay balloons assembled to a larger structure. Photograph by Mårten Medbo.

Attempting to capture and describe meaning, whatever that meaning may be, is a risky endeavour. Meaning is a blurry, slippery term. There are many craft and practitioner researchers that have approached meaning from different angles, embedded in the materiality and the making processes (Boos 2009; Ingold 2009; Nimkulrat 2009) or associated to knowledge and communication (Mäkelä 2007; Malafouris 2008; Groth 2017). In this text I will focus on meaning that has been deeply important in my life. Turning to my own experiences in pottery, the meaning created by and through the craft goes in two directions. The first is directed inward at me, myself, as the person performing, and the other is directed outward, toward our shared world. Inner meaning is created primarily from the physical and cognitive faculties that the craft can bring to life within the practitioner. Here, the act itself is central. The outwardly directed meaning is generated through the capacity of crafts to communicate via the materials formed by the craftsperson (Medbo 2016). This meaning is linked to the results of the crafts. The outwardly directed meaning, or the communicative meaning, emerges in the encounter between peoples and materials. My reflection begins with meaning that is directed inward, toward the craftsperson's self.

THE INWARD MEANING OF CRAFT

To begin, I would like to emphasise that the inward meaning that I have experienced requires reasonable working conditions if it is to emerge at all; that is, I as a craftsperson must have independence and take responsibility for the whole work process. As a ceramist, I have had the fortune of working under precisely such conditions and have repeatedly ex-

Figure 3: : Assembling of thrown parts. Photograph by Hanna Stahle.

perienced a deep sense of meaning in the crafting process. It is possible to repose in that meaning and dwell on the situations in which it is experienced. The meaning, then, is linked to the crafting practice itself and not the ultimate result. There is a risk here, as meaning is created through the practices themselves, that their practitioners can repress the result and effects of their actions (cf. Csikszentmihalyi 1990; Arendt [1958] 1998; Sennett [2008] 2009; Medbo 2016).

Wheel-throwing as a craft has a long history, one in which the craftsperson has a deeply intimate and sensual relationship to the clay material. I consider the sensual aspect to be significant in and of itself. The meaning that is generated through crafting, however, is multifaceted, and it cannot be explained simply as a close, sensory relationship between craftsperson and material.

A Special Sort of Logic

For example, there is a special sort of logic in the craft. Eventually, every craftsperson knows that mental and physical effort is required to penetrate and comprehend that logic. The logic of crafts is a practical one. This counts at least for the parts of the craft that are not dictated by external perceptions of it; that are not dependent on how its significance is culturally or socially read. It is, one might say, 'pure' craft knowledge, referring also to Gustav Thane in this anthology, concerning the physical requirements that make the craft possible—the body, the material, and their interplay (cf. Malafouris 2008). When it comes to throwing, knowledge about material manipulation, hand movements, and the clay's qualities during rotation are defining for this aspect of the craft (see also Groth 2015). There are different ways to swim but, in essence, all swimming follows the same principles. The same goes for throwing. The fundamental principles are non-negotiable—in swimming and in throwing. Because of the specific and compulsory conditions, throwing makes certain physical and mental demands on the thrower in a particular way. Throwing determines how attention is focused and how the physical responses are made. If perceived from a Platonic ontology, these fundamental requirements may be described as the idea of the crafts. And just like any other logical system, it is perceived as meaningful for anyone dependent on it.

Possessing and obtaining craft knowledge is satisfying in itself. The logic of crafts is the fundamental requirement for learning the skills. While practicing a craft, knowledge is revealed directly and patently. Learning takes time, and all of the notations that accompany the practice of a craft may perhaps lapse into dullness. Personally, however, I derive continual joy from developing my skill as a thrower. When practicing a craft, actions and movements must be performed over and over again. The repetition should not be mistaken for a completely uniform process, however. Each repetition makes small, precise adjustments of the actions possible, based on insights gained in the previous attempt. On top of that, when practicing a craft, the craftsperson can test their perceptions of the craft's limitations more radically, thereby challenging the technical and formal perceptions about what is possible that are embedded in the craft traditions (cf. Tempte 1997, 81). Every opportunity to practice the craft becomes an opportunity to sharpen one's skills. Correspondingly—in my case, not throwing—I lose focus and skill. Craft knowledge makes demands on the entire person and links the craftsperson to the material world. This knowledge makes no differentiation between the physical and the spiritual; it is theory and practice as one.

The Joy of Repetition

There is also, in the practice of a craft, a possibility to enter a certain mental state. Flow is a relevant concept to discuss in regard of inner meaning. According to the psychologist Mihaly Csikszentmihalyi (1990; 2003), flow could mean slightly different things for every person, trying to describe their own experience of the phenomena. But basically it describes a mental state that makes the person involved in the activity forget about themselves. It is only the task at hand that exists and the person is filled with satisfactory and joyful feelings during the activity (Csikszentmihalyi 1990, 58). One basic factor common to all activities with the capacity of inducing flow is said to be that the challenge in the activity must be balanced to the capacity and skill at the person involved in the activity. The chance to reach flow increases the closer the performer is to her limit of what is possible. When in flow, the activity becomes a goal in itself and is rewarding without regard to the final result of it (Csikszentmihalyi 1990, 16).

The experience I am about to describe here is of a slightly different nature, even if it shares some common features with the concept of flow as described above. One thing that differs is that activity in focus here is not rewarding due to it being challenging mentally or physically. This is about the joy of repetition.

When manipulations and movements are internalised and have become embodied knowledge, it is entirely possible to set one's thoughts free whilst working. Naturally, there are often situations in which a craftsperson's full concentration is required, but in repetitive work there is potentially always room for free thought. In reality, the phenomenon is not much different than the liberating and calming effect that, for example, a walk can have on the mind (see also Huotilainen et al. 2018). Parts of the mind can easily be dedicated to other pursuits whilst one is walking, and it need have no detrimental effect on the quality of what one is doing. On the contrary, the quality of what one is doing can sometimes be improved by not thinking about what one is doing. When it comes to practicing embodied knowledge, analytical reflection about precisely what one is doing can be counterproductive, disturbing the process rather than supporting it (Nobel 2014). For the benefit of the final result, the knowledge must be able to come forth without conscious mental effort. I cannot claim that my thoughts are particularly deep or creative when I am throwing thousands of my clay balloons; instead, it is a question of a sort of meditative state in which one can repose—a state that can subdue both anxiety and stress. It could be added, with my ongoing studio work as an ex- ample, that that the feeling of flow, as defined by Csikszentmihalyi, sometimes occurs during my work assembling the thrown clay parts to lager art objects. This is a process that is much more mentally demanding than producing clay balloons. (Figure 3)

The Perceptive Craftsperson

The experienced craftsperson, I would say, becomes a participant in the craft collective that tends to the knowledge in question. As a ceramist and thrower, then, I am always part of a collegial context, both through my own craft knowledge and my capacity to interpret the body of works that throwers have left behind throughout history via that knowledge. A craftsperson is linked to their own history and has amplified potential to interpret the artefacts related to the craft. This amplified potential of craft skills to interpret crafted artefacts is what the ceramist and archaeologist Katarina Botwid investigates in this volume. I argue that there is also an additional cultural perspective in which craft experience creates a context of meaning with a particular, craft-focused fusion of horizons. Craft experience renders the world tangible and concrete, but the craftsperson's sensual relationship to the world also explicates its complex character. Through crafting, the craftsperson participates in the formation of the world (see also Ingold 2021). But forming the world has a starkly limited capacity, and the craftsperson must thus also stoop before the world. On the whole, this gives the perceptive craftsperson an opportunity for a sensitive, dialogical relationship not only with his material, but also with the world as a whole (cf. Sennett [2008] 2009, 286–96).

I have provided a few examples of how the crafting process is capable of creating a sense of meaning in relation to its practitioner, as well as begun to touch on the meaning that is generated through crafting's results. This meaning is directed outward and is linguistic in character.

THE OUTWARD MEANING OF CRAFT

I argue that there is an inherent communicative potential in crafts. In principle, this opportunity is available to all craft practitioners—that is, not only to practitioners of art and art and crafts, although they are in focus here. The communicative potential is what at one time grabbed my interest and led me to dedicate my professional life to ceramics. Clay gives me the possibility of expressing things which are eluded to by the other linguis-tic channels at my disposal. And like my primary language—the spoken and written language—my clay-based communication also generates context and meaning. In fact, for us as social beings, language is essential on an existential level. It is a well-grounded statement that both art and crafts have the potential to create social meaning (Morris [1888] 2010; Sennett [2008] 2009; Rosengren 2015). Possibly, this potential to create meaning is what has been able to keep alive craft practices that can in many other ways be considered obsolete and that is why so many time consuming, old techniques persist in art and in crafts. I would say the ability of crafts to create social meaning is superior to their effectiveness in an economic sense.

Craft-based Expressions

As the reader will probably have guessed by now, I believe that art and crafts should be considered as fundamentally language phenomena. There is a point in discussing arts and crafts as linguistic phenomena. Besides the fact that the language perspective highlights the social and ethical aspects of crafts in a clear fashion, the part of art that generates meaning is also emphasised.

I suggest that the production of craft-based expressions basically shares the same prerequisites as every other production of linguistic expression. A reasonable point of departure to support the suggestion might be the assumption that all communicative expressions require some kind of materialisation in order to be perceptible and reach their recipients. Clay is my material and means of expression, and my task as a ceramicist is to make the clay communicate. And for this to be possible, I require craft knowledge. It is possible to extend this understanding of craft to encompass all linguistic production—not only that which takes place in clay. What can become linguistic materiality is determined by our perception, by what we can perceive. Clay in the form of ceramics can be experienced in a tactile manner, spatially, audibly, and visually. The linguistic means of expression that we utilise are of broadly different types and have broadly diverse qualities. Just as with physical capacities, it is possible to create languageness with the help of various means. Some linguistic means, such as speech, are fleeting, whilst others, such as fired clay, are sturdier.

But regardless of their permanence, both concern linguistic expressions. And in both cases, the communication and dialogue depend on the ability to express and also to interpret the domain-specific linguistic articulations. The faculties of speech and craft skill are physical abilities that must be learnt and practiced. It is easy to forget, but we all struggled to learn how to talk as children. Seen thus, it is entirely feasible to compare the articulative faculty that creates speech with the ceramicist's capacity of craft that allows us to make the clay communicate.

The "Mother Tongue" of a Thrower

Let's assume that there is such a thing as clay-based linguality. By using an example from my thesis "Lerbaserad erfarenhet och språklighet" ("Clay-based Experience and Communication"), this could be further elaborated. Michael Polanyi writes in his book *The Tacit Dimension* how speech schematically can be divided into a number of levels, each one dependent on the previous; if you fail on one level, you will fail on every level to follow ([1966] 2013, 60).

This is Polanyi's scheme for production of speech:
1a. voice
2a. words
3a. sentences
4a. literary style
5a. literary composition

Every level is guided by a set of rules and norms. This is Polanyi's scheme of rules and norms for speech:
1b. phonetics
2b. lexicography
3b. grammar
4b. stylistic
5b. literary critique

In accordance with this system, I made an attempt to fit clay-based expressions into a similar scheme (Medbo 2016, 114).

This is my scheme for production of clay-based expressions:
1c. dexterity
2c. form, texture
3c. forming
4c. ceramic style
5c. ceramic composition

This is my scheme for guiding rules and norms for the production of clay-based expressions:
1d. craft-skill
2d. material knowledge
3d. artistic understanding of form and texture
4d. knowledge of ceramic style
5d. ceramic critique

The two systems do not correspond perfectly but sufficiently enough to show how clay-based communication and speech are structurally related.

Now I will try out the schemes as a kind of filter to better see what is going on in my own ceramic practice. I will focus on my ongoing wheel-throwing project. By putting the ceramic practice in a similar scheme as Polanyi used for speech, I hope to create a better understanding of some of the basic conditions for craft expressions in clay.

As mentioned earlier, I have put up a framework with a set of rules for my studio work: it must build on throwing, and signs of the throwing technique must be viewable in the finished artwork. Furthermore, I have decided to work with a kind of ceramic assemblage (see 5c) consisting of thrown parts, all with air captured within them. This narrow frame could be regarded as a personal artistic hypothesis for successful wheel-throwing or a kind of personal poetics for wheel-throwing (see 5d). By using my ability to throw I am able to create a repertoire of shapes to use for my ceramic compositions. Basically, I concentrate on two forms: the sphere and the toroid (Figure 4). The spheric forms can sometimes be prolonged to sausage- or egg-like forms. These forms function as building blocks (see 2c) or, according to the scheme (cf. 2a), clay words. As mentioned in the introduction, my clay words or clay balloons have special physical properties, mainly because air is captured inside them. In a sense, they are charged with meaning just like verbal words are. The meaning is not once and for all given and will change depending on context (cf. Wittgenstein 1968; Medbo 2016).

Figure 4: Examples of wheel thrown shapes. Photograph by Mårten Medbo.

From the same clay words it is possible to create an inexhaustible number of different compositions (Figures 5, and 6). The principal is the same as for verbal words. My clay words will have a personal character since they are pronounced by me. I have a certain mother tongue of throwing (see 4c and 1d). It is highly influenced by my time as a thrower-apprentice at Gustavsberg's Porcelain Factory. The throwing tradition at the factory (which has since been closed down) was primarily represented by the master thrower Berndt Friberg, and it is strongly associated with modernism and Swedish Grace. This is considered to be Swedish throwing at its highest quality (Eklund 2011, 111–23). I throw according to the artistic understanding of form and texture at Gustavsberg, technically perhaps most characterised by the use of thin metal sheets to remove all slippery clay and all traces of the hand from the surface, creating clay objects with smooth surfaces and clean lines (Figure 1). To continue the speech metaphor, my mother tongue of throwing can be described as somewhat supercilious. There are technical benefits of this way of throwing in regard to the rules I have sat up. Normally you would leave the thrown parts for a while to give them time to dry a bit before handling them in order to avoid messing up the sensitive surface (the captured air will prevent them from collapse, as mentioned

Figure 5: Examples of works done according to the method described in this chapter. From the exhibition Morphology at Avesta Art, Avesta 2021. Photograph by Mårten Medbo.

earlier). But the drying makes the parts lose some of their plastic properties which I am dependent on to realise my artistic intentions. But if all the slippery clay on the surface is removed by using a metal sheet, it is possible to make use of the freshly thrown parts immediately to build bigger structures without making a smudgy mess of it all (see 2d). The number of parts in one finished ceramic work can range from two (Figures 5 and 6) up to several hundred.

The languageness of clay also involves stylistics. Actually, as a ceramist, I actively try to cultivate my own style since a personal style is an important asset on the art/craft scene where I show my work. It is easy for me to tell from where I was influenced as a thrower, but it is much harder to say from where I am influenced when it comes to my ceramic style.

Obviously, there is more than one source of relevance here and the sources are not only from the field of ceramics. Nature, cartoons, philosophy, films, and contemporary art are sources of inspiration. It is also apparent that my ideas of ceramic style and the critique have changed over the years. That is not very surprising. It would have been very

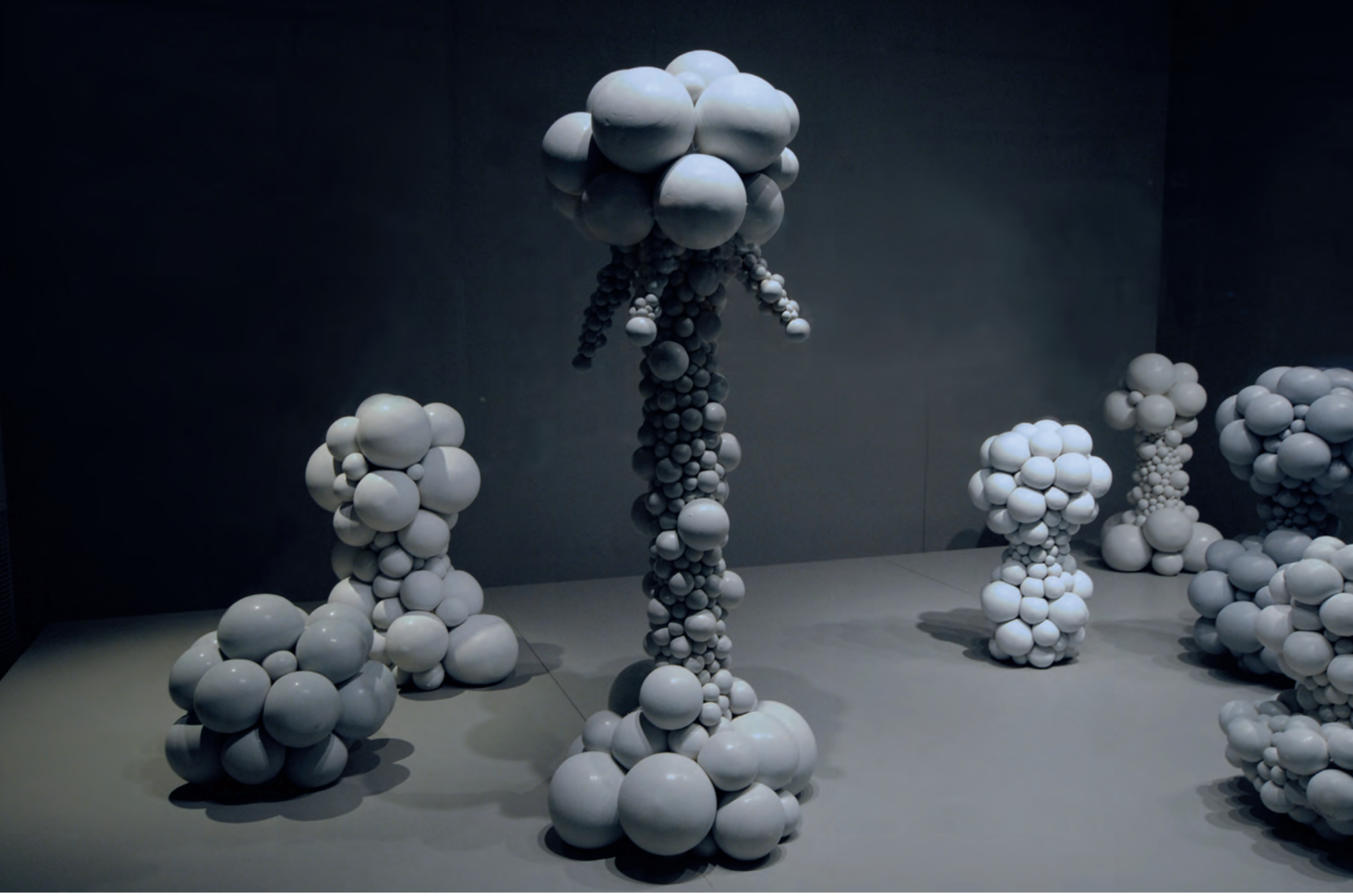

Figure 6: Examples of works done according to the method described in this chapter. From the exhibition Stolen Fire at Exposé, Linköping 2020. Photograph by Mårten Medbo.

depressing if what I wanted to say, and how I articulated that, hadn't changed during my 30 years in the profession. What has not changed very much, though, is my mother tongue or my craft skill, even though it has hopefully improved a bit.

DISCUSSION

The languageness of craft-based expressions and the use of traditional craft techniques are not always valorised or passable. The materiality may be seen as a hindrance. The Swedish Public Art Agency's director Magdalena Malm states, as an example of this perspective, that contemporary art "has liberated itself from material, [from] museum halls like no other art form, and expanded to a series of other areas" (Nyström 2013, 9, my translation). The point of view represented in the quote is not uncommon in art theoretical contexts. In alignment with the western, dualistic point of view, the immaterial is more desirable than the physical, tangible materiality (Toulmin 1990; Bornemark 2018). Here, the material is regarded as an obstacle and something from which to break free. If material is something to avoid, and words and text are not considered as possessing materiality, verbal language, preferably in the form of text, gets a higher status than more prosaic materialities such as, for instance, clay. This idea, which plays an important part both in conceptual art and conceptual crafts, is counterproductive when it comes to the linguistic richness of art and its capacity to create meaning. Ideas about immaterial art lead to a kind of linguistic imperialism (cf. Wallenstein 1996, 141).

In the traces of industrialisation, a lot of craft practices have been suppressed and unable to compete with mechanised production. Arguing in favour of the relevance of traditional crafts today can, in a broader perspective, be difficult. For me, however, crafts are more than a(n) (ir)rational production method for the manufacturing of various things. For me, crafts have always been relevant because of their capacity to create meaning. In many ways, that meaning chafes against modernity's rational and economically coloured conception of the world.

I have in this chapter explored craft and meaning, both from a personal inward perspective and a communicative outward perspective. Both of these perspectives on meaning may explain why I, and many others, stubbornly stand by our craft practices and our material, and why art and crafts still continue to affect and concern us. I believe that it is vital to reflect on and discuss both craft and materiality in relation to meaning and I think that it is desirable that everyone who, in some way or another, has an interest in the field feels compelled to participate in such a discussion. It is my hope that this text will inspire to that.

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RE-CLASSIFICATION

In the theme Re-classification, the authors discuss classification as a tool in the personal, group, and educational sense-making process of craft practices. Essentially, it may be both a clarification and a communication tool. In the chapter "Understanding through Blacksmithing Techniques" Gustav Thane is attempting to classify verbs used in the practice of blacksmithing in order to analyse the actions within his practice. In the chapter "Classification of Plant Propagation Practice" Tina Westerlund presents her classification system for gathering documented knowledge on plants' propagation for the purpose of a systematic knowledge communication and dissemination.

Traditional blacksmith master **Gustav Thane** is a PhD candidate at HDK-Valand on the faculty of Fine, Applied and Performing Arts at the University of Gothenburg. Thane was awarded a master with a Master letter in the blacksmiths trade by the Swedish Craft Council 2017 and a MFA at HDK Steneby in 2009. He also run the Ryfors bruk forge for 10 years employing journeymen, training apprentices and specializing at designing and producing ecclesial metal art as well as functional object such as axes and grave signs. Thanes research revolves around tool manufacturing, affordance and the theory of a workshop floor.

KEYWORDS: Craft, craft theory, craftverb, blacksmith, tacit knowledge, taxonomy, technique, forging.

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Understanding Through Blacksmithing Techniques

By Gustav Thane

DESCRIBING THE BLACKSMITH'S CRAFT

Ten words.[1] That is the number of named techniques listed in *The Blacksmith's Craft* (Rural Development Commission (RDC) 1997, vi; see Figure 1). Is that all there is to it? As a traditional master blacksmith, I am pretty sure I have wrought metal in more ways than that. Of course, I did not read books to begin with; I learned the metal craft in a forge, observing and talking to others, trying things out myself. I do read the books now though, in order to see how others describe the blacksmith craft. I am used to talking about *craft activity* as naturally as I talk about the crafted *objects.* I have looked into how metal craft can be described verbally, as an activity, separate from its resulting shapes. This, however, does not allow a complete picture of how metal craft is generally described. I propose an alternative way. As a contemporary blacksmith and a practice-based researcher, I am in need of a way to describe my craft. I look for a language, relevant to a post-industrial context, capable of housing the specific concerns and meanings of a craftsperson in action—a craft theory. If practitioners fail to contribute to craft theory, we are confined to using concepts and methods put forward by non-practitioners, with the risk of us adopting an impractical view on craft. But I do not assume to invent it; theory is already used within the field. In this chapter I attempt to extract that theory and articulate a feature of this craft logic to be illuminated and made possible to critique.

Ulf Linde, Swedish art critic, wrote about *the aspect of the artefact* (1968), the objects intentionally wrought by a human hand, not the materials used, the object's function, form or shape, but the act of cultivation—the work. He described it as human time spent. That is the main value of an object: days and years of someone's life. Linde referred to traces and hammer marks in Neolithic stone

Verb
Taking a Heat
Drawing Down
Bending
Upsetting
Jumping Up
Hot Cutting
Punching
Drifting
Fire Welding
Heat Treatment

Figure 1: The 10 craft-specific verbs listed in the introduction of *The Blacksmith's Craft* (RDC 1997, vi).

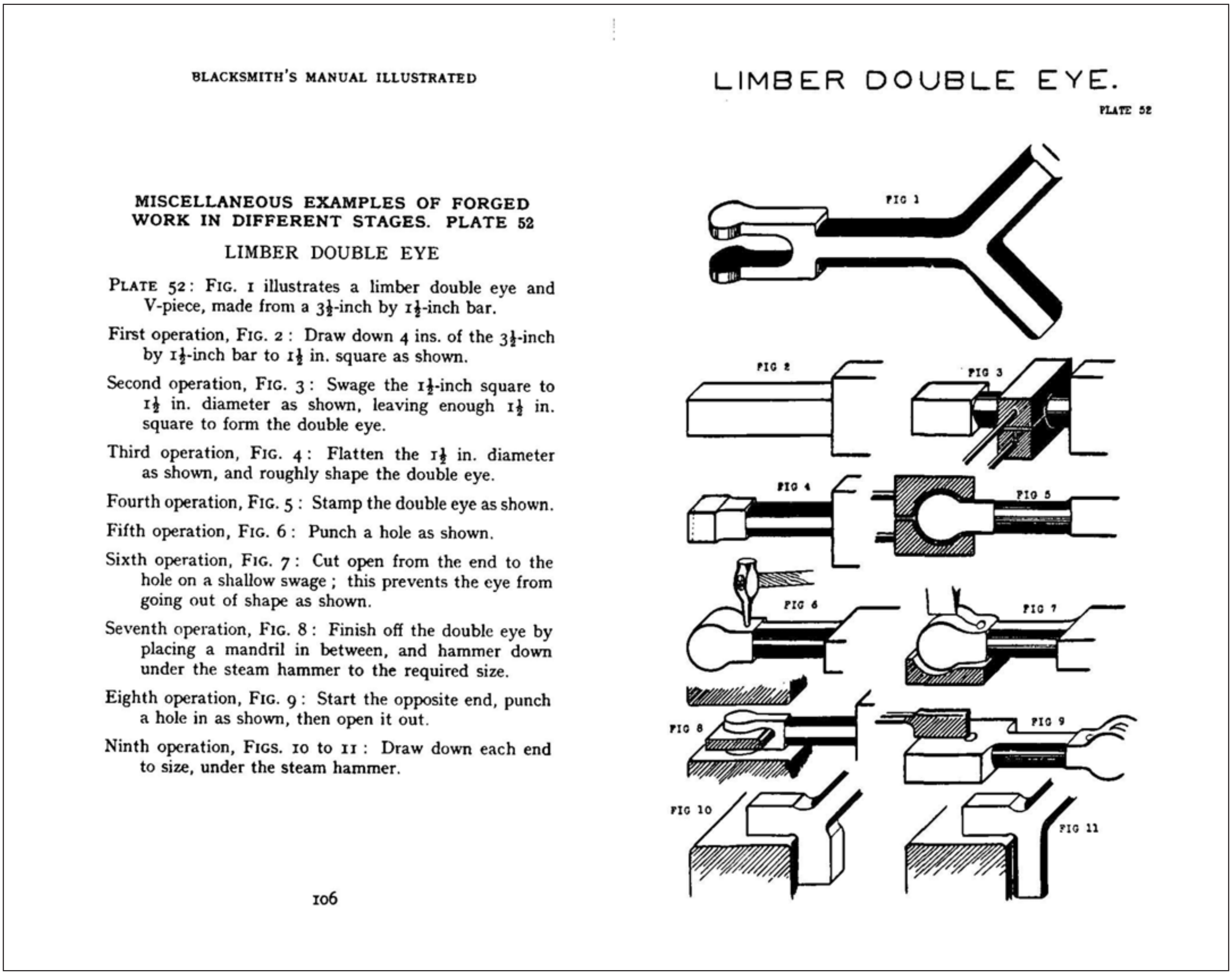
axes, but the marks led him to the acts, skills, and prior training of an experienced maker. Linde's role as a critic allowed him to trace hammer marks. I am one of those making the marks. My interest in his writing is the shift away from the form, shape, and function of objects into a debate about human time and engagement (Linde 1968, 15, 18).

A similar thought is mentioned by Paul Klee in his diary and elaborated upon by anthropologist Tim Ingold (2010). Klee's reflection, that work is life and its resulting object is death, sounds to me like an urge to stay in a creative process—an acknowledgement of a maker's perspective. Ingold chose to highlight the part about life and death, reasoning about the connection between a maker and the making process. When it ends the work dies. He seems to imply that art theory, based on analyses of art pieces (objects), is building a case on dead material. When I make an axe, I sometimes try it out before delivery, but the axe will live out its life in the hands of woodworkers. To me, as a blacksmith, life with an axe is really *life with a hammer*. When the axe emerges, it is no longer part of my life as a blacksmith. The craft leading up to an axe is not the axe itself, even if the two are connected and hammer marks can be traced (Ingold 2010, 91–93).

I believe craft theory can be based on the act of cultivation. Ingold describes this act of cultivation as life; the making processes. The words describing these processes hint at a conceptual framework, or theory of the workshop floor indigenous to craft practice. One way to approach this theory is to look at the language that allows a craft to be understood as activity first, as human time and engagement, rather than objects. The class of words known as verbs[2] define that feature. They do not describe forms and shape, but actions, manual-gestures, and activities, as they are used in a workshop. Such a vocabulary and theory might be suitable in order to process a sort of knowledge and content active in a creative process. And even if it is not, my experiential knowledge of a direct and relevant theory, indigenous to craft, might just lead to a reflection which is useful for observing ontological value within the craft sciences.

Reading *The Blacksmith's Craft* a bit further, it becomes obvious that the authors writing for RDC use a larger variety of technique verbs in the text; they were simply listing the ten basic techniques—a sort of simplification. The book is targeted at beginners. Another book, J. W. Lillico's *Blacksmith's Manual Illustrated* (1997), clearly targets experienced blacksmiths, and it engages an extensive craft-specific vocabulary: I counted 49 verbs to describe the blacksmith's craft activity (the words are listed in Figure 3 below). While there are further words describing objects (nouns), the 49 are the only terms describing an action, a technique, a verb separate of its resulting shape… But perhaps I am just greedy. How many words do we need?

In this chapter, I propose that craft verbs reveal traces of an already existing conceptual framework,



BLACKSMITH'S MANUAL ILLUSTRATED

MISCELLANEOUS EXAMPLES OF FORGED WORK IN DIFFERENT STAGES. PLATE 52

LIMBER DOUBLE EYE

PLATE 52: FIG. 1 illustrates a limber double eye and V-piece, made from a $3\frac{1}{2}$-inch by $1\frac{1}{2}$-inch bar.

First operation, FIG. 2: Draw down 4 ins. of the $3\frac{1}{2}$-inch by $1\frac{1}{2}$-inch bar to $1\frac{1}{2}$ in. square as shown.

Second operation, FIG. 3: Swage the $1\frac{1}{2}$-inch square to $1\frac{1}{2}$ in. diameter as shown, leaving enough $1\frac{1}{2}$ in. square to form the double eye.

Third operation, FIG. 4: Flatten the $1\frac{1}{2}$ in. diameter as shown, and roughly shape the double eye.

Fourth operation, FIG. 5: Stamp the double eye as shown.

Fifth operation, FIG. 6: Punch a hole as shown.

Sixth operation, FIG. 7: Cut open from the end to the hole on a shallow swage; this prevents the eye from going out of shape as shown.

Seventh operation, FIG. 8: Finish off the double eye by placing a mandril in between, and hammer down under the steam hammer to the required size.

Eighth operation, FIG. 9: Start the opposite end, punch a hole in as shown, then open it out.

Ninth operation, FIGS. 10 to 11: Draw down each end to size, under the steam hammer.

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Figure 2: A spread from J. W. Lillico's book, *Blacksmith's Manual Illustrated* (1997). Verbs are used to describe the techniques to use; illustrations are used to describe what shape to end up with.

a specific understanding of metal craft which is based on how it has been described by experts within the craft itself (commercial craft, craft education, artistic and virtuosi craft practice). The metal-craft verbs, and the way of reasoning, I propose, make up a sort of family tree—a taxonomy of human activity. Through the lens of such a system, an understanding of craft is separated from step-by-step description of craft procedures as well as descriptions of crafted objects. This focus may allow an analysis of metal craft activity which is relatively independent of otherwise closely related things, such as artistic expression or the functionality of an object.

BLACKSMITH CRAFT AND BASIC RESEARCH

Almost 300 years ago, Swedish botanist Carl Linnaeus made a huge contribution to the field of natural science. By gathering and naming specimens of different plant species, he, and later his disciples, organised biological life into a hierarchy of species, families, orders, and kingdoms—a system able to house all kinds of life (Linnaeus 1758). Linnaeus's achievement was to produce a structure for how data could be organised. His work can be considered the foundations on which Charles Darwin based his theory of evolution, followed by a whole field of botanists and zoologists. Back then, several taxonomic systems existed in parallel, but something in Linnaeus's approach made it more productive to his field than the competition. Linnaeus's taxonomy has nothing to do with the blacksmith's craft or verbs; it has to do with logic, systems of information, and basic research within botany. However, that line of thinking, which systematises an aspect of a field in order to gain a focus on some things rather than on others, made sense to me. Systematising a certain aspect of a craft could be a sort of basic research in craft practice as well.

Similar endeavours of systematisation have taken place in the history of crafts at different times. One of the most famous examples is the 1751 *Encyclopédie* edited by Denis Diderot. The *Encyclopédie* differs from several other attempts to gather information in the sense that Diderot himself, being the son of a knife maker, understood the necessity of engaging experienced practitioners to describe what they were actually doing (Knothe 2009). Yet, a major part of his descriptions of craft focus on the tools. He often describes *what tools* to use rather than *how to use the tools*, as if the tool is synonymous with the ability to use it.

Basic research, such as that undertaken by Linnaeus, sometimes holds a key to data. By constructing a taxonomy, Linnaeus enabled some questions to be productive and others to fall out of the academy. If such an important foundation was to be laid for metal craft research, I argue it would have to be found in the *activity of craft* rather than in the literature of nearby fields such as art history, design theory, architecture, or in any commercial, industrial approach (see also Westerlund in this anthology). Below, I will introduce a starting point for one such possible taxonomy of human activity which is not based on *what tools to use*, but on the techniques of metal craft, or, in other words, on *how to use the tools*.

TOWARDS A TAXONOMY OF CRAFT VERBS

The verb of a technique rarely holds a specific meaning in the sense that it describes an activity that could only be done in one way. Depending on the forces applied to a material, the direction of the force, and what stock material to begin with (etc.), infinite variations exist. The whole variation will not be of use in a taxonomy but can be considered akin to the equivalent of individual characteristics within botany. When making a drawing of orchids for a scientific volume, the character of a species is often pictured, or highlighted, rather than a specimen itself. This can be considered analogous to craft verbs, and how they may be understood in a taxonomy of craft activity; all possible variations of the technique *to bend*, for example, can be treated as subspecies or even individual characteristics of the same general principle. The common denominator—the principle on which they are divided in the craft tradition—can, in this craft verb taxonomy, be treated as different species in the same family.

Verb	Occurs	Endings (Comments) Page nr.
Temper	13	-ed, -ing
Forge	12	-ing
Weld	29	-ing, -ing methods
Jump	12	-ing
Harden	23	-ing, -ed
Heat	25	-ed, -ing
Plunge	12	-ing, -ing into water/oil
Bend	40	-ing
Rivet	5	-ed
Punch	23	-ing
Cool	5	-ing off, -ing, - off,
Fuller	38	-ing, -ed
Flatten	18	-ed down, -ing, - down, - out
Cut	76	-ing, - of, - through, - open
Round	10	-ing, - of
Swage	15	-ing
Draw down	106	-ing down, -n down, - out, -n out
Square	8	
Hammer	30	- down, -ing, -ing down, -ed
Sink	3	
Side set	51	-ing, -ed
Taper	11	-ing, -ed
Straighten	2	-ing
Form	4	-ing
Machine	1	-ed
Drill	11	-ed
Stamp	12	p. 106, p. 128, p 158
Turn	2	-ed up (as in bend 90 degrees)
Bolt	1	-ed
Draw in	1	- the circumference
Pull around	2	
Scarf	2	-ing
Joggle	5	-ing
Point	3	-ing
Double	3	-ing, - over
Open out	8	
Split	6	- open, -ing
Set back	1	(as in bending)
Twist	3	
Nick	1	-ing
Spread out	1	p. 132
Raise	2	- to a welding heat
Set	5	-ting the arm (as in straighten)
Screw	1	-ed
Set through	3	p.168, p. 141
Polish	5	-ing, -ed
Dip	3	
Case harden	3	-ing
Anneal	1	-ing

Figure 3: The 49 verbs used on 657 occasions in J. W. Lillico's book, *Blacksmith's Manual Illustrated* (1997). Words are listed in the order they first occurred in the book. All verbs are in the list made into the basic form of a verb, variations of the techniques are listed in the right hand column.

Added	Group	Technique
	Forge	Draw down Taper Point Jump Flatten Round Square Side set Set through Fuller Sink Nick Swage Stamp Spread out Set
	Form/Bend	Bend Turn Pull around Joggle Double Open out Set back Set Staighten Twist
	Cut	Cut off Cut through Cut open Scarf Split Punch
	Machine	Drill Cut (with a bandsaw)
Join		Weld Rivet Bolt Screw
Heattreat		Heat Temper Raise Anneal Cool Harden Plunge Dip Case harden Anneal

Figure 4: The 49 craft verbs listed as they cluster together in groups of similar techniques. To the far left are group names added by me.

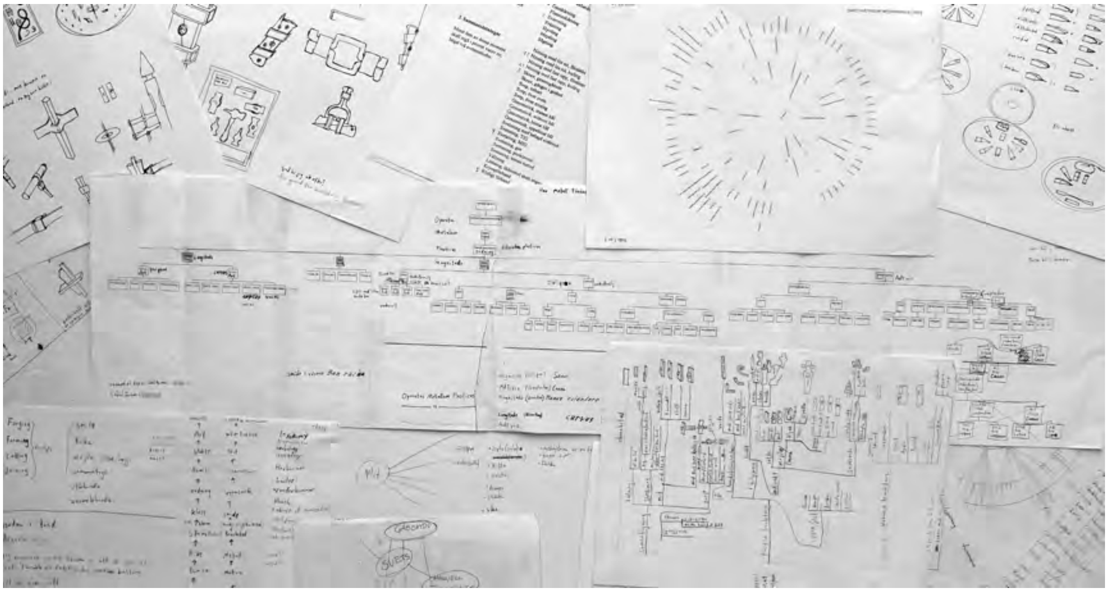

Figure 5: The many words collected in Swedish, arranged and systematised in different iterations.

One of the major contributions of Linnaeus was to name things in a new way. A jellyfish and a shellfish are not various types of fish; they are something else, and their Latin names and positions in his taxonomy clarify this. The same goes within metal craft; to *set back* (1) is a sort of bending, to *hot set* (2) is a way to make the metal thinner and longer. In the present anthology, Tina Westerlund argues that research performed by experienced craftspeople has the advantage of including past experience of craft activity through which to interpret information and put it into context. Based on such experience, I say those two actions, (1) bending metal and (2) making it thinner and longer, are two rather different principles of metal craft. I do not propose techniques to be organised by the way they are named. The taxonomy is instead based on the similarities of *how* they allow a person to engage in materials. The verbs are important though: they are treated as species or subspecies, as principles of how force is applied on materials.

Lillico's intention with the *Blacksmith's Manual Illustrated* was to describe *how to* "complete the job in the most expeditious manner" (1997, vii). In this case, "the job" involved power hammer forging on an industrial scale. He mainly described craft as an activity. If not counting general verbs like *make*, *shape*, or *finish off*, the 49 craft-specific verbs in the book occur 657 times. Some of the verbs have more or less the same meaning, such as *draw out* and *draw down*. Other words imply a higher level of abstraction, like *to bend* which is related to (or the family name of) other terms like *to joggle*, *double*, *set back*, and *turn back*. Grouping the words like this make up at least two levels of abstraction.

Using the verbs from *Blacksmith's Manual Illustrated* (1997), I can see the words cluster together into groups. But four of them describe technique

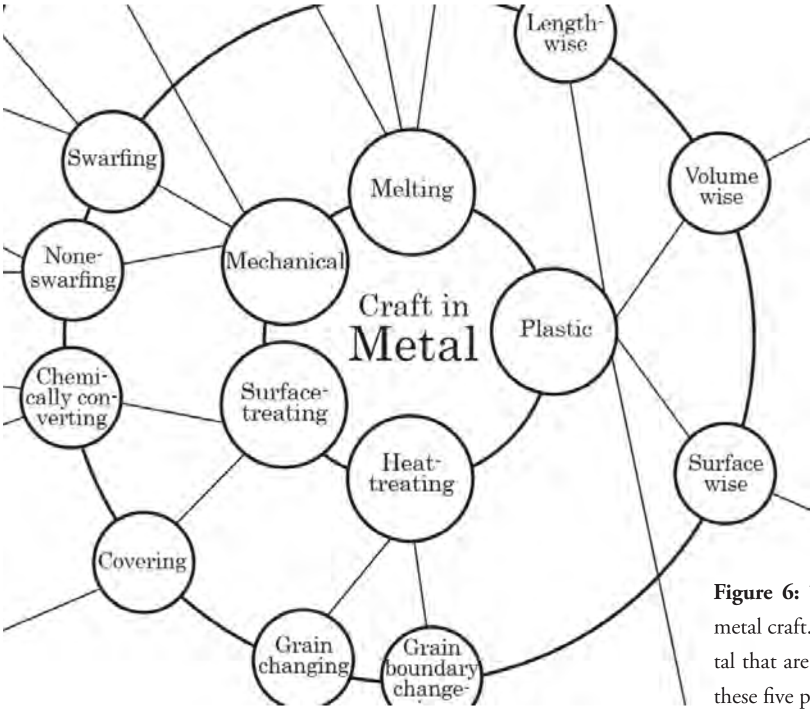

Figure 6: These are the basic principles of metal craft. Few things can be done with metal that are not part of, or a combination of, these five principles.

on a higher level of abstraction: forge, form, cut, and machine. I think of those words as family names or group names. When I add the group names *join* and *heat treat*, almost all of the technique verbs in the book are included in the six groups. But some words fall out of such a clustering: *to hammer* is one such example.

To hammer is a verb describing an action—not just one action, but almost all actions possible with that tool. *To hammer* is really a noun used as a verb, describing the tool applying force. The verb *to hammer* describes the act of applying force in a different way than other tools or machines, such as *to press* with a hydraulic press, *to roll* in a rolling mill, or *to hammer* with a power hammer,[3] but you can still draw out,[4] bend, or perform most other techniques with either one of those tools. This seems to make it impossible to fit techniques, named after a general tool, into this taxonomy.

I had to decide how these techniques, named after a tool, fit into a taxonomy of craft verbs. Do I treat *to hammer* as a higher level of abstraction, a lower level of abstraction, or as a noun not fitting into the list? First, I tried to put it higher up. In this example, it would have forced me to understand *drawing out by hand* as a different technique than *drawing out in a power hammer, a press, or a rolling mill.* It would make sense since those four imply different manual-gestures, different versions of an action. However, despite the sense it made, I could not find traces of this in the language of metal craft. When describing a technique performed with different tools, generally the same verb is used. On a higher level of abstraction, there should not be a more precise description of the action.

Since the verb *to hammer* is clearly a metal craft activity, it fits in the family tree. My conclusion in this example is to treat it as a lower level of abstraction—a grandchild in the family—a common denominator of this lowest level of abstraction being its character of applying a technique onto something, with something, or to achieve a specific quality or shape in the material. Those characteristics got to share a level since they are all entangled with each other in a non-linear way. They also allow variations that far exceed the levels above. With this level of abstraction, the way metal craft verbs can be used does not help me in organising a craft verb taxonomy, at least not in a way which is balanced between the various technique groups.

OTHER SOURCES

Originally, I made a simplified inventory of the blacksmith vocabulary in Swedish. Swedish blacksmith literature is rarely written by experienced blacksmiths. My original aim was to see whether the oral descriptions I use and encounter in conversation with other blacksmiths would differ from those in the literature. I expected to find words of local dialect and thought it interesting to map where they are used. I wrote down all of the techniques I could come up with (see Figure 5). I then met and talked with masters and retired craftspeople from different metal crafts, such as sheet metal workers, moulders, welders, jewellers, etc., adding verbs to the list as a result of these meetings. In this work, I discovered the special character of verbs, describing nothing but the activity.

I presented the list of verbs, as far as it went, and explicitly asked the experts to name verbs that they had actually used throughout their careers. I also asked what they assumed would be variations of the same principle and what the family name of that group could be. This is where the idea of a family tree occurred and evolved. The family tree of verbs was presented at workshops at craft schools, blacksmith meetings, and blacksmith forums. Each time I attended one of these places, the list would grow a bit and sometimes groups were rearranged, joined, or abandoned. This far in, oral descriptions were the focus. When I eventually tried to translate the whole project into English, the original problem of verbs lacking in the literature did not seem to be as prominent in the English literature. *The Blacksmith's Craft* (1997) and *Blacksmith's Manual Illustrated* (1997) proved me wrong. My list of spoken verbs, translated into English, corresponded to the verbs used in those books. The list of spoken verbs was longer and included a few more technique groups, but I concluded that verbs have been written down, in English. Consequently, the inventory was reinvented, as described above.

The 49 craft verbs of Lillico are accompanied by more than twice that number found in interviews, workshops, and other blacksmith forums. Subjected to the same sort of logic, they cluster together. Where words neatly fall into place and describe craft in different levels of abstraction, they add to the list. Where verbs do not fit, they are confined to the lower levels or used to reorganise the higher ones. At this point in time, I no longer looked actively for more words, but introduced the process of systematising the verbs into a larger taxonomy, based on my experiential knowledge of craft theory.

THE HIGHER LEVELS OF THE TAXONOMY

Lillico's book and the initial interviews in Swedish offered me the three lowest levels of abstraction, the hands-on levels: the technique group, the specific technique, and the application of the technique. To inform the higher levels of abstraction, I decided to keep looking for concepts within the practices of metal work. All blacksmiths are metal workers but not all metal workers are blacksmiths. The jeweller, sheet metal worker, and fabricator all process metal, but it comes into their workshops in different formats and leaves it ever more diverse. The division of labour between metal workers often correlates with the techniques named with a verb, at least in an approximate sense. Working with cheat metal demands a larger variety of verbs describing ways to fold metal compared to a blacksmith who would rather focus on the manipulation of thickness in the material. They are all metal processing techniques; they are related, but not closely. The format of the sheet metal, metal bars, dices of metal, etc., became my lowest level above the verbs. It made sense to use metal itself as a top level of all metal craft.

I divided the top level—metal craft—into the smallest number of fundamentally different ways of processing that I could see. My experiential knowledge suggested that there are four basic principles of processing metal by hand. I was long unsure whether surfacing ought to be included. After a closer look, I decided that it should be, so that there are now five basic principles. These principles are all associated with their own trades within the metal work community, and differ fundamentally.

1. *Forging* is based on exploiting malleable features, the ductility of metal, making it thinner and longer.
2. *Heat treatment* uses and eploits the molecular features of metals.
3. *Casting* builds on the possibility of melting and pouring metal into something else.
4. *Surface treatment* often aims to counteract the material characteristics of a metal by preventing rust, etc.
5. Most other activities performed with metal are different sorts of *mechanical* removal of materials, such as abrasive or cutting techniques.

CHALLENGES AND POSSIBILITIES

Most of the levels above help in dividing the metal craft techniques into groups small enough to be understood as variations on some principle of metal craft. Other clusters of techniques are exceptions to that rule. Joining techniques are such an exception. Joining techniques are often described as one of the basic principles of metal work (Aspery 2011). But in this taxonomy, they, as a group, cut straight through the basic divisions of metal craft. Not only do they fit nicely into different groups, but a lot of them also combine different techniques in a specific order, much like objects. They are even referred to with nouns. A mortise and tenon joint (noun) is one such technique. It is common within carpentry as well as in metal work. To a blacksmith, it combines the following actions: (1) to punch[5] a hole, (2) to set down[6] on two sides, (3) to draw out, and (4) to rivet (or wedge), and a rivet is really a bar being (5) upset[7] after having been placed through a hole.

THE EXCEPTION OF JOINERY

Throughout this chapter I have explored traces of a theory, seemingly indigenous to craft. The technique verbs and division of labour are easy to recognise. They imply there is a system, existing before I pointed at it, based on how verbs are used to describe actions. Still, joining techniques are often named with a noun: a rivet, a collar, a weld, etc. Joints are normally achieved by stacking techniques (verbs) on top of each other, just like an artistic expression is achieved or a functional object. And they do have a function: they hold metal bars together. When trying to describe technique without the description of form, shape, and function, some techniques, like joinery, seem more like a function than an action. At first glance I took this as proof

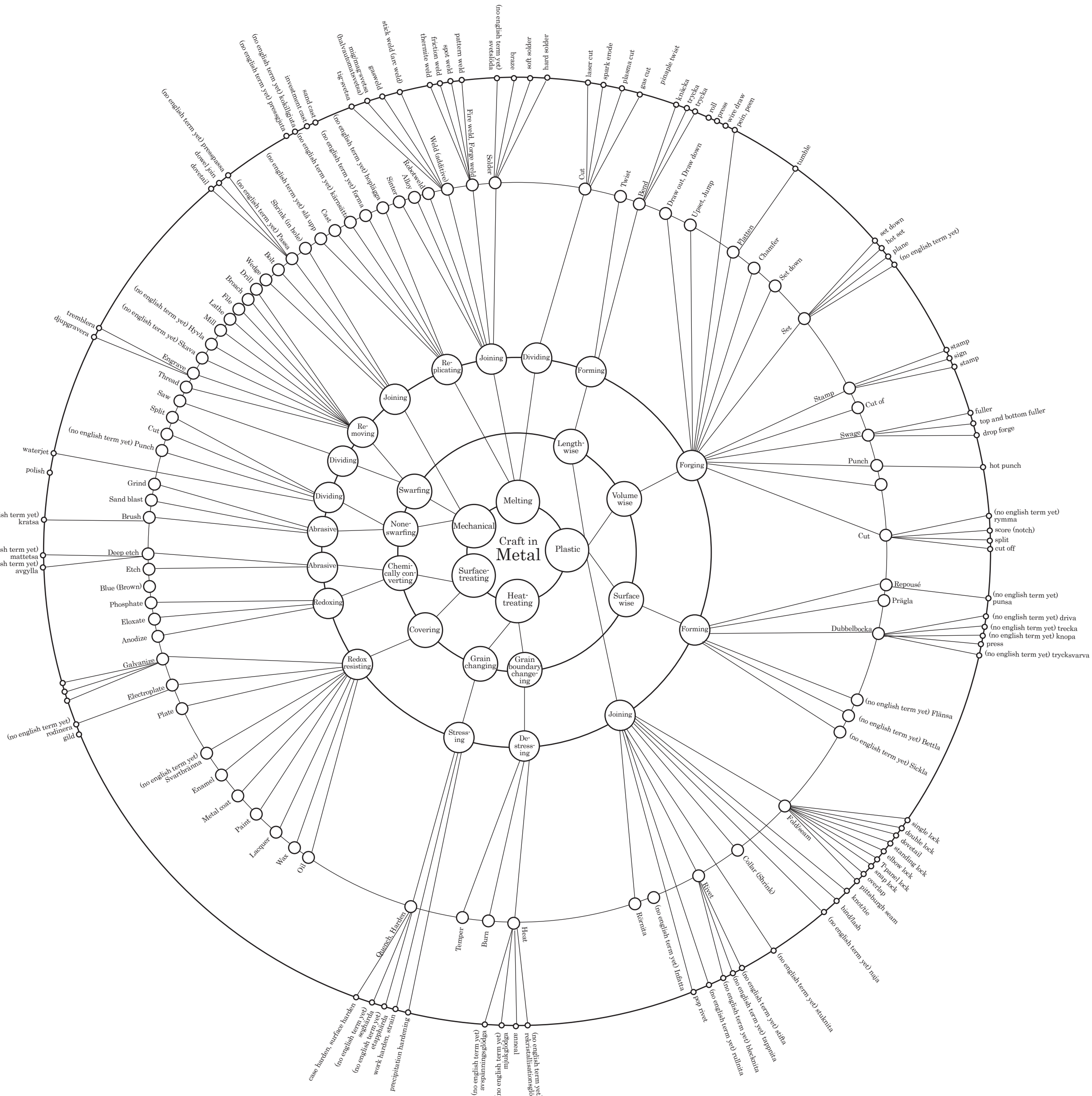

Figure 7: The radial tree limited to the techniques of metal craft. At least this is how the techniques were organised when this text was first published. The tree is crowd sourced and will keep growing and evolving as long as practitioners keep updating the website at at https://craft-research.com/radialtree

that the system I was tracing was not composed in the way I first thought.

At the same time it illustrates the very gain of this theory. It allows a specific line of thinking. When a rivet is not understood as a rivet—a thing, a noun—but as the action— (1) *to punch* a hole, to place a round bar through it and (5) *to upset* it, make it thicker at both ends—it is not an object anymore but a period of human time spent. And not just time spent doing anything, but spent in a way coloured by the prior experience of a blacksmith, the embodied material, and the tools. Describing this process through its various steps—not each individual blow with a hammer, but the technique, the principles—highlights *how* the craft links a craft person to a material. I believe this to be a perspective best enquired by an experienced practitioner, hence a theory fit for craft research.

The joining technique is often named with a noun and thought of as an object, but the noun can be changed into a verb. It is a lot like the axe I mentioned above. When the rivet has come into being, it is no longer of the blacksmith's concern. A rivet is an object, a noun, just like an axe, but *to rivet* is a verb. A rivet normally applies pressure on both sides of a hole, joining bars of metal, and that is similar to how a blacksmith applies force with a tool. But that function is the result of a rivet (noun), not the action of a blacksmith, not the action *to rivet* (verb). I will call this a *material function* so as not to confuse it with the function of a product, which is supposed to be left out of this chapter. And I will treat technique nouns which can be turned into verbs as actions, at least as long as they have been used like that in actual workshops. It is possible *to mortice and tenon join* even if this specific technique sounds to me like pushing it a bit.

When organising the joining techniques into a taxonomy, I found no reason to exclude those verbs which are more complex than just one action. As mentioned, joining techniques are actually a number of other techniques performed in a specific order, *specific* being the operative term. I concluded that those are still activities acknowledged by the field as such, and since they have been named with a verb, they will fit into the family tree.

They could be placed on the lowest level with its non-linear vastness of variations and where applications of techniques can be found. But *joining* is not without order; it is a feature represented across the metal craft similar to its opposite—to divide material. *To cut* can also be found in different groups. Some of the clusters of techniques have inherent fundamental features, akin to the *material functions* of *to join* and *to divide*, like surfacing, normally either oxidising or preventing oxidisation. And more can be found as opposites all over the tree. Different understandings of these features allow different positions in the taxonomy. I had to make a choice of how to treat those exceptions. After trying several versions out, I decided to treat those material functions (not to be confused with product functions) as a mid-level group. I did this to specify those features above the level of technique groups (verbs), given joinery's status within the field of metal work as an organising system. That is also a good position to take since the joining techniques often include several other techniques. Tying them to a higher level of abstraction makes it easier to find a group where all, or most of them, already belong.

No hierarchical order seamed fruitful to me; between the various techniques of one particular level, none is first and none comes after. The features and material functions implied a horizontal line, connecting at least this level of abstraction all over the tree. Thus, after balancing other levels of abstraction in a similar way, I ended up with a radial tree, which is also rather space efficient.

The Exception of Decorative Techniques
Collecting verbs like this is not without problems. Andreas Nobel would say that written language has its inherent possibilities and limitations while craft has others (Nobel 2014, 46–48). Craft research might lose some of its strengths when adapted to written language, adopting new limitations in the process. If so, compared to the crafted objects, the limitations of verbs would seem similarly (or even more) problematic in relation to the activity. On top of that, could organising the words in a taxono-

Figure 8: Small camping axes forged by me (2002). One is silver/copper encrusted, the other two are pattern welded. Photography by Gustav Thane.

my add further confusion? Or even render selective aspects of a craft invisible?

Strictly decorative techniques are problematic. The value of encrusting lines of silver into an axe surface is purely ornamental. When such a technique is described as a five-step joining technique, it might sound like this: 1. Engrave,[8] 2. Cut,[9] 3. Bend, 4. Encrust,[10] 5. File/Sand.

Such a description is not just difficult or even impossible to follow; it also misses the very point of ornamental endeavours. The softer metal, silver, is joined with the harder iron in a specific way, an example of a joining technique. But the purpose of this technique is not to join pieces of metal; it is all about creating a visual, artistic expression. In the taxonomy, the decorative techniques are not described for what they are intended to communicate: art. Instead, they are simply described as a series of actions. Without the illustrations or exemplifications of what shapes those actions intend to create, they do not even allow an experienced blacksmith to follow the technique described if the blacksmith does not already know it. Not only do practitioners need to know how the metal is supposed to move in the different steps in order to work together in the end, this very technique is also dependent on four specific fit-for-purpose tools. The craft verbs are a description in the sense that they line up techniques in an order—nothing more.

This, however, is the very scope of the chapter. Metal craft, when described solely as technique verbs, captures something different than a craft manual or process description. It focuses on one specific aspect of a craft, an understanding found in the manual-gestures of named techniques, namely its principle, a system of forces, or action in relation to a responding material. When this is described as human time spent, it is a very specific mode of knowledge. It is a mode of knowledge which is commonly used in craft, but theoretically underdeveloped and scarcely represented in other fields of research.

THE BEGINNING OF A THEORY

So, how many words do we really need? I do not know, but the number of verbs in the radial tree is larger than I previously knew. I do not think of metal craft as a linguistic endeavour, but the possibility to describe it, as an activity, might lead to meaningful exchange within the crafts. As a teacher I will be more able to describe the fundamental principles when there is a word to house its meaning. And the division of the concepts into family groups likewise allows me to differentiate the way I make an axe from the ways that others do it. But I do not think that is the major advance of this chapter. Systematising the verbs offers something else, something similar to a practice-based model or the beginning of a theory. The radial tree is more than just a list; it is a taxonomy of craft activity. It describes things on different levels of abstraction. It organises metal craft relatively independently of the objects normally produced through it. Essentially, it puts the technique verb—a very specific aspect of a craft—in the focus of academic debate.

The radial tree also makes it clear how some techniques speak of a tool, others of a relationship between a craftsperson and metal without any acknowledgment of the tool. A hammer, a press, and a rolling mill are all tools (nouns) which can be turned into vague craft verbs, but the tools can all be used *to forge*, to *draw out*, or *to bend* with (verbs). The technique verb is often the same regardless of the tool used. Those technique verbs are not equivalent to a tool, shape, or function but a set of principles of the forces in a material, the action of a craftsperson, and the related kinematics. Those are the words pointing at the relationship between a maker and a material, the level of abstraction allowing us to enquire into this specific craft aspect of human time spent.

Above, I have illustrated how the taxonomy allowed me to understand and describe craft activity without the need to describe closely related things, such as artistic expression or functionality of the objects produced. In a way, this is the conclusion of the chapter. Collecting and organising technique verbs allowed me to describe a specific aspect of metal craft. At the same time, the circular tree is a database enabling the systematic archiving of craft techniques.

CONCLUSION

This is craft theory. A list of words enabling diverse descriptions of embodied skills. And the argument that practice can be understood as the principles named with a technique verb. Not only could this aid a teacher to describe craft for what it is in the moment of creation, it may also allow a researcher to problematise and critique an aspect of craft, best enquired in action. This potential theory does not intend to lean towards artistic craft nor conservation craft. As a theory it attempts instead to unite the two otherwise separate craft fields into one research practice.

The mode of knowledge I am referring to is primarily observable when craft is described on the second and third lowest levels of abstraction in the taxonomy. Below this level, other concerns such as aesthetics, tools used, or the functionality of a product affect the descriptions of craft. Above it, materials used and formats of the materials likewise affect the relationships between techniques. But in those words—the craft verbs—I have identified an explicit way to talk about craft activity itself on the premises of a practitioner. Based on the taxonomy, I propose that great detail in metal craft activity can be described in an explicit, propositional way and there is a specific level of abstraction where this possibility ceases. The identification of this specific level, where metal craft activity is the best option to reach knowledge, is an advance of this work. Dialogue more specific than this needs to be illustrated somehow to make sense, just like more general descriptions do. This is a starting point from where to begin asking questions about metal craft, questions that do not speak about metal craft in general but of metal craft as it is embodied in the *movements*—the motor skills of shaping a material by hand.

I am drawing a line here: the line between a piece of work and work itself. It is an attempt to treat human time spent, discipline, and engagement as knowledge. I am not surprised to find a rigorous pattern of theory within the language of my craft. Through it, I suddenly saw my own actions and the practice of teaching them in a new way, as a rivet became the process *to rivet*, a form turned into human time spent. The list of words is published at www.craft-research.com/radialtree and if you know a craft verb missing in the list, feel free to add it.

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ENDNOTES

1. Taking a heat; drawing down; bending; upsetting or jumping up; hot cutting; punching and drifting; fire welding; heat treatment.
2. Verbs are generally used to convey an action, an occurrence, or a state of being. In the basic form (infinitive), you can put the word to in front of it, such as to forge, to turn, to paint, etc.
3. Power hammer, press, and rolling mill are all machines used to apply pressure on the metal to reshape it.
4. Drawing out is the technique where pressure is applied from two directions on a metal bar at 90- or 45-degree angles to each other. This makes the metal thinner and, at the same time, longer.
5. To punch a hole is a technique where you hit a punch (hardened steel tool with a flat top) into hot metal. After hitting the punch almost straight through the metal from the first side, you turn it 180 degrees and allow it to cool down a little (to around 650°C). You place the punch on the opposite side and hit. When the heated material is punched from the first side, it creates a deep cavity, and the material from the cavity is spread out making the rest of the metal swell out. The second time, the now swollen and relatively cold (hard) edges around the cavity hold a thin coin. When hit with the flat top of the punch, it will not bend but will crack along the side edges of the punch. The thin coin will fall out and you have a hole… and a coin, the size of the hole.
6. To set down is a group of techniques where force is applied on metal indirectly in the sense that a piece of heated metal is placed on or between a passive tool (set of tools) such as an anvil or a hot set. Force is applied with a hammer (or press) on the other side of the metal or on top of the hot set making the metal thinner on a strictly limited area, normally leaving the shape of the passive tool as a cavity in the heated metal.
7. To upset, bump up, or jump the material is the technique of making a piece of metal thicker and at the same time shorter.
8. To engrave is to cut a long groove into cold metal with a burin or similar, normally for decorative purposes.
9. To cut metal can refer to several different techniques. In this case it refers to the sort of cutting that is done with a chisel when the metal is cold in order to split a small part away from the rest of the metal.
10. To encrust is the name for the whole technique described but it also refers to its main feature of forcing a softer metal into the fishtail-shaped groove in a harder metal by hitting a punch placed on top of a thread of the softer metal placed on top of the cavity. The softer metal will get locked into the cavity while parts of it that did not fit in there are smeared out in a line on top of the harder metal's surface. Normally this smeared out line is grinded or filed allowing only the metal buried in the groove as a contrasting coloring on the surface of an object.

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KEYWORDS: Classification, craft research, craft systematisation, documentation, perennials, plant propagation, propagation practice.

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Classification of Plant Propagation Practice

By Tina Westerlund

INTRODUCTION

When large numbers of gardens and garden centres choose to buy ready-grown plants from other countries, the knowledge transfer in plant propagation practice is at risk. Previously, this kind of horticultural knowledge has been a natural part of the gardener's competence, but with changes in people's attitudes to plants, in divisions of labour, and in industrialisation and globalisation, local professional propagation practice is decreasing (Ryberg 2012; Olausson 2014). However, this craft tradition is important in order to meet the challenges of creating a sustainable and resilient society. UNESCO has pointed out documentation as one way to safeguard traditional craftsmanship, an intangible form of cultural heritage (UNESCO 2003). This raises an overarching question: *How can knowledge in craft be documented so that it can be conveyed to others systematically?* In this chapter I will focus on that issue in relation to the gardener's knowledge of propagating plants.

In practice situations, experiential knowledge transfer between practitioners is facilitated by the materials and actions seamlessly and in real time. When experiences and knowledge are described separately from the practice, for example as an instruction in a book, knowledge transfer may be hampered by the representational difference. Within propagation, one of the challenges in mediation lies in the great diversity of plants, their variations in form, and their differing stages of development. A common way of distributing knowledge of cultivation and propagation is by presenting information sorted alphabetically according to plant name. While this is functional, it does not support the possibilities of making comparisons and finding relationships between variations in plant forms and presumptive propagation methods. Another challenge in the knowledge communication is that general practice also varies because of the fact that there are personal and situational ways of doing things. A result of these different variations is that important details of the practical knowledge are often left out from the written instructions.

There is also a general problem, sometimes referred to as the tacit knowledge of craft, when the practitioner has so much of a routine within their craft that they do not have to pay attention to the knowledge that is being used (cf. Polanyi 1966, 10–11, 16–17). What is perceived as obvious is rarely described. The bodily and sensual aspects involved can be difficult to capture and put into words (cf. Tilley 2006; Ehn 2014; Palmsköld and Fabler 2018). Even so, the attention to sensual assessments is a vital part in the transfer of craft knowledge.

Motivated by these challenges, I have searched for a way of systematising plant information so that it responds better to the knowledge of propagation practice.

Systems for classifying organisms have a long tradition. One well-known example is the sexual system of the plant kingdom, launched by the gardener, botanist, and taxonomist Carl Linnaeus (Carl von Linné after his ennoblement) in 1735. Above all, classifying systems like this tend to revolve around organisms or objects being arranged into groups according to particular attributes. The systems create a practical way to sort information about the objects. In order to meet the complexity involved in communication of plant propagation knowledge, a classifying system could be adapted to the practice.

In this chapter, I will present a classification system for documentation of propagation practice that I developed during my doctoral study, and introduced in my doctoral dissertation, written in Swedish (Westerlund 2017). By documentation, I refer to different kinds of media that give information about the propagation practice. This documentation can be compiled instructions, or collective narratives of someone's experiences, told without the aim of instruction. The classification system is adapted to the vegetative methods used in plant propagation.[1] Vegetative propagation occurs in some species in the wild, but it is also used in horticulture—humans' organised cultivation. Instead of seeds, certain plant parts are used, such as pieces of stem, leaves, or roots. When they come into contact with moisture, they form new shoots and roots, and develop into new plants. My systematisation involves grouping plant parts used in vegetative propagation in order to link them to descriptions of the practice.

I will present how this classification system can be used by showing examples of documentation from the propagation of a plant called the shooting star (*Dodecatheon meadia*). This plant was chosen because I also want to highlight the necessity of craft knowledge in safeguarding plants of historical interest. The shooting star was cultivated in Sweden, as early as in the second half of the eighteenth century by Carl Linnaeus, and it grew in the flowerbed at his house in Hammarby, outside Uppsala. Today, his home and garden are a museum, and the flowerbeds have been reconstructed and the shooting star is growing there again (Figure 1A-B).[2] By keeping the plant in this place, a story is told about Linnaeus and his important work with plants. Since the shooting star does not spread by itself in this environment, a preservation of it at Hammarby implies continuous horticultural propagation.

If documentation intends to serve as a safeguarding strategy, it benefits from being adapted to the craftsmanship involved. This requires an understanding of what kind of knowledge is to be

Figure 1A: The Shooting star (*Dodecatheon meadia*) at Linnaeus's Hammarby. Photograph by Jesper Kårehed, The Linnaean Gardens of Uppsala, Uppsala University.

Figure 1B–C: The so-called mull benches outside the house at Linnaeus's Hammarby are reconstructed after Linnaeus's own descriptions (B). He writes about them in a letter to the French botanist Antoine Gouan in 1765 (Linnaeus). Among the plants is the shooting star (*Dodecatheon meadia*), which develops its leaf rosettes in the spring and blooms in the early summer (C). Photographs by Tina Westerlund.

documented (cf. Tunón, Kvarnström, and Malmer 2015; Almevik 2016). Therefore, I will also discuss the meaning of my own experience within the documented craft practice. For research to contribute to advancing practice, the research must pay attention to the needs and logic of systematising information within the practice under study.

KNOWLEDGE PERSPECTIVES ON THE PRACTICE OF PLANT PROPAGATION

In order to make a statement about what propagation knowledge entails and how it can be documented, I have used Bengt Molander's understanding of knowledge-in-practice and his idea about three different orientations of the concept of theory (Molander 2015; 2017; Molander in this anthology). He describes theories as "human system of orientation with which we move forward, intellectually and/or in more concrete terms, in the world" (Molander in this anthology, 377). When this orientation is based on someone's experiences, it is seen as subject-oriented theory. In relation to knowledge development within craft research, Molander also emphasizes the importance of "separating the purely subjective from that which is tenable and informative for everyone with (adequate) craft proficiency" (ibid., 391).

When theory attempts to describe how to act in different contexts, Molander explains it as a practice-oriented theory. In relation to craft, he suggests that a practice-oriented theory can help to "establish and maintain robust connections between craftspeople and what they work with and on [...]" (Ibid.). Theory from an object-oriented perspective is described by Molander as follows:

> Theory is also designed to highlight (describe) 'the real,' the underlying forces and tendencies (etc.) that control what happens within a specific area of reality. A theory should go beneath the surface of empirical observations and experiences (which reach neither the smallest parts nor the biggest entireties) and present the most fundamental components of reality. Theory in this sense is to depict or represent reality. (Molander in this anthology, 377)

Molander points out that all three perspectives are needed in the understanding of knowledge-in-practice. Thus, to investigate what knowledge in practice in the craft of propagating perennials with vegetative methods entails, I have combined these three theoretical perspectives (Westerlund 2017). In this text, I will proceed from this understanding and discuss how an object-oriented perspective can be used to form links to a practice-oriented perspective. This link acts as a starting point for communicating the documentation of propagation knowledge in a systematic way.

THE CRAFT IN PLANT PROPAGATION AND THE CRAFT IN RESEARCH

Within horticultural research, the general focus has not been to describe craft knowledge. Literature in plant propagation published by universities in the early 1900s partly describes craftsmanship in the professional tradition, but does so mostly in general terms (e.g., Bailey 1911; Kains [1916] 2007; Hottes 1925). This is natural when we consider that plant propagation was practised at that time by many people, and the know-how of, for example, when and how cuttings are made was taken for granted. In recent decades, the scientific focus has been on making cultivation in the commercial nursery business more effective (Preece 2003). The development of knowledge in the field is further described, but with less and less focus on the craft (e.g., Bowes 1999; Hartmann et al. 2002; Preece and Read 2004). With this background, there is a need to develop strategies for documenting knowledge of plant propagation. My goal is to make a contribution to this development and to bring these issues to the fore.

I have been active in the field of maintenance and cultivation of plants for many years, as student, professional gardener, teacher, and lately as a researcher. By working both alone during my research training and together with students as a teacher, I have acquired much experience in the vegetative methods of plant propagation. During this time, I compared and tested existing manuals and descriptions of plant propagation and I observed and documented plants in various stages of development. An important part of the inquiry has been participation in work at nurseries, where propagation is still part of the business (Westerlund 2014; 2017). The research methods I have used at the nurseries have consisted of interviews, observations, and participant observation (cf. Ehn and Löfgren 1996; Ehn 2011; 2014). As well as taking notes of what I heard and observed, the work has been documented with photographs and in some cases with video. Afterwards, I have brought together different types of information into documentations of the performed procedures. By using these different methods, I have switched between being the researcher and the research subject—a research strategy used in autoethnographical studies, where the researcher's personal experience is used in, for example, the analysis of a practice (Ehn 2011; Adams, Holman Jones, and Ellis 2015).

Practice as a part of the research methodology is used in practitioner-research (Niedderer and Reilly 2010; Sjömar 2017; Mäkelä and Nimkulrat 2018). In relation to research in art and design, Kristina Niedderer and Linden Reilly point out the importance of integrating experimental knowledge in organised inquiries in order to "facilitate a holistic approach" (Niedderer and Reilly 2010, 8). They also encourage researchers in other fields to develop methods that include experiential knowledge, not only for providing data and to verify theoretical conjectures or observations, but also because:

> the inclusion of practice in the research process or as a research outcome helps to integrate and communicate those kinds or parts of knowledge that cannot easily be made explicit, such as the tacit part of experiential knowledge, commonly known as tacit knowledge. (ibid., 6)

What is the difference between professional craft practice compared to the use of craft practice in research? Peter Sjömar, director of research in the craft field, reflects upon what unites and distinguishes craftsmanship and craft research: "in both situations, one reads and interprets signs: in professional practice to choose and control between different methods and materials, and in research to manage and represent knowledge" (Sjömar 2017, 110, my translation).

My experiential knowledge from this practice field opens up the possibility for conversations with others who are experts in plant propagation. This experience helps me to interpret information, to ask relevant and specific questions, and to put the received information into a context. I can relate to what the other expert says and performs, although a certain propagation situation is new to me. This in turn means that I am more likely to be accepted in the craft environments I visit, as mutual experiences increase opportunities for communication (Kaiser 2000, 103). Based on our mutual experiences, we can communicate and reflect over the actions, and on descriptions of actions. By working together, communication and experiential knowledge transfer can also take place in action.

EXISTING SYSTEMS OF CLASSIFICATION FOR VEGETATIVE PROPAGATION

Since there are a lot of presentations of vegetative propagation in literature, there are also a number of examples of how information can be collected and communicated. Each source of literature gives examples of systematisations. Handbooks on gardening or specialised literature on plant propagation contain descriptions of horticultural propagation, while the botanical literature describes plants' natural ways of spreading. In this section I briefly discuss advantages and disadvantages in the systems used for categorisation in horticultural and botanical literature. This is followed by a reflection of how gardeners themselves gather their experiences.

Systematisation in Horticultural Literature

The conventional way of communicating knowledge about the cultivation and propagation of plants in horticultural literature is to sort information according to the names of the plants (e.g., Miller 1733; Bailey 1911; Lorentzon 1989; Toogood 2006). This is usually arranged in alphabetical order of the scientific name of the plants. This system makes it easy to find information related to the plant that you are searching for, and more information can be added successively. The system has its disadvantages, however. Carl von Linnaeus criticised it in the eighteenth century: "If the cultivation of individual plants were to be described in this way, the work would grow into so many books that it could scarcely ever be read" (Linné [1754] 2007, 13, my translation). Linnaeus had a point; certainly, the gathered information would soon be too extensive to be able to give an overview of it. He believed that the only way to give the horticultural culture a place among the "noble sciences" was to choose a method that describes gardening according to climate and soil—in other words, to classify it based on plant environments (ibid., 13).

Examples of systems for presenting descriptions of propagation based on plant environments are represented in some horticultural literature (e.g., Hills 1950; Toogood 2006). These kinds of classification categorise the propagation methods by explaining how cultivation should take place in relation to the environments from which the plants originate. From a craft perspective, this way of explaining horticultural practice says more about adaptations to the growing environment than how variants of methods are adapted to a large diversity of plant forms.

Other systems for presenting propagation methods are based on the plant parts that are used for propagation, such as shoot tips, stems, leaves, bulbs, or roots (cf. McMillan Browse 1999; Hartmann et al. 2002). These systems provide descriptions for a number of different propagation methods. In some cases, a general description is given for each method; in others, the methods are described on the basis of one or a few plant examples. The disadvantage of most of these systems is that they use examples of woody plants (trees and shrubs) more than they do herbaceous plants (perennials and annuals). This often results in even greater generalisations, which result in further difficulties when comparing the description with a real case.

A related subject area that utilises classification of both plants and methods in a systematic way concerns weed control. This subject area is about unwanted propagation and describes methods for combating the spreading of plants. When weeding methods are communicated, it is partly done on the basis of different plant forms, like how to handle plants with deep tap roots or plants with horizontally growing stems (e.g., Bolin 1933; Adams 2004; Lundkvist 2014).

Related Systems of Classification in Botany

Other types of classification systems that can be linked to vegetative propagation are those used in botany to describe plant morphology (the outer shape of the plants), life cycles, and dispersal biology (cf. Klimeš et al. 1997; Bell 2008; Widén and Widén 2008). These systems contain descriptions of the different parts of a plant, but sometimes also how plants develop over time. The main groups in most of these systems are based on *stems*, *leaves*, *roots*, and *flowers*.

Another system based on life cycles concerns the so-called "life forms" that Christen Raunkiær first published in 1907 (Raunkiær 1934). It does not sort plants according to vegetative reproduction methods but according to how they survive cold or dry periods, specifically where the surviving parts are located in relation to the ground surface.

None of these botanical classifications are adapted to the practice of plant propagation. However, they have some similarities with the knowledge held by the experienced plant-propagating gardener.

The Gardener's Systematisation

Some of the gardeners I have met document which plants they propagate at a certain time.[3] The records seldom contain descriptions of how things are done, but they are an example of gathered information recorded in chronological order, which can later be supplemented with experiences of results. This is information that links plants to different human actions at different times in a propagation process. Such documentation is sorted by plant name. For the gardener, it is a functional way of gathering information that can be saved for many years and used for assessments in future working situations. Throughout my conversations with other gardeners, I perceive that their systematisation of experiences mainly takes place in another way, which is not as easy to document. It could be described as an 'inner systematisation' to gather knowledge of plant forms, how plants change over time, what properties are of importance, and the outcome of different propagation methods.

Historian Pamela Smith describes something similar when she presents experiences from reconstructions and interpretations of an instruction on binder making with elm roots from a sixteenth-century technical manuscript (Smith 2016). In the reconstruction, they became aware that they could not get the guidance in today's categorisations where elm is represented because these only took morphological descriptions into account. Smith noticed that the author of the manuscript, presumably a craftsperson, seems to have performed his own taxonomy: a categorisation of the materials "on the basis of the properties they exhibit, or the processes through which he puts them." She calls it "his system of classification" (ibid., 223–24).

When Donald Schön presents his theory of knowledge in professional practice, he describes that the reflective practitioner builds up "a repertoire of examples, images, understandings and actions," which "includes the whole of his experience, as well as being accessible to him for understanding and action" (Schön [1995] 2003, 138). Likewise, I see the gardener's inherent propagation knowledge as a repertoire of examples, based on comparisons of actions in relation to different plants and their developmental stages. Development processes in gardening vary in time, which means that in some cases it takes a very long time to build an experience of these, if it is even possible at all. The knowledge can be conveyed through examples, but the whole repertoire of experiences that this knowledge is built on is not represented in these examples. Even the knowledge of systematising information can be seen as tacit.

Both of these ways of systematising experiences—"the chronological" and "the inner"—are specifically adapted to the gardener's own practice. What I developed as a result of my research is a form of systematisation that can gather experiences from many different types of activities and situations of work with plant propagation.

A CLASSIFICATION SYSTEM FOR THE PROPAGATION PRACTICE

The method for systematising that is presented allows plant parts to be linked with information about the practice of horticultural plant propagation. From now on I will refer to this system as the Classification of Propagation Practice (CPP). Unlike most other systems of presenting propagation practice I have found, the CPP only involves perennial herbaceous plants. I have made a hierarchical system of plant materials, grouped according to the differences in their structure. The system is built in three to four levels of groupings which lead to 32 groups, or categories, of plant parts. These 32 categories represent different plant parts used in vegetative propagation of perennials. I call these *propagating parts*. The classification results in the grouping of propagating parts with different attributes, and these differences also require different methodologies in the propagation practice. Here follows a brief description of how the system is formed.

What is special about this system compared to others is the division of plants into three main groups: 1) parts above the ground; 2) parts above the ground and underground; and 3) underground parts (Figure 2). These three groups constitute the first level in the hierarchical system. Here, I was inspired by Raunkiær's division which is based on where the surviving organs of plants are situated

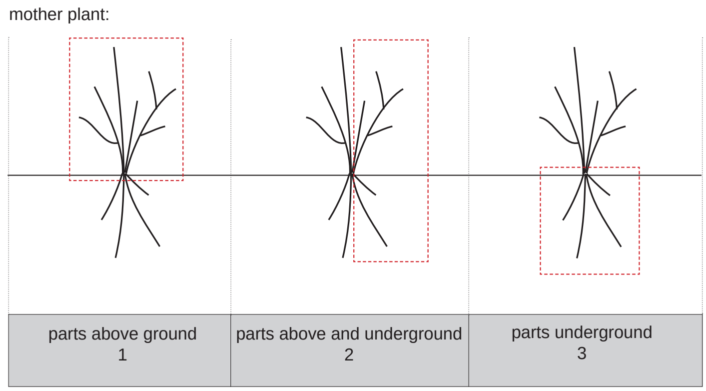

Figure 2: The three main groups in the Classification of Propagation Practice (CPP). Image by Tina Westerlund (revised from Westerlund 2017, 74).

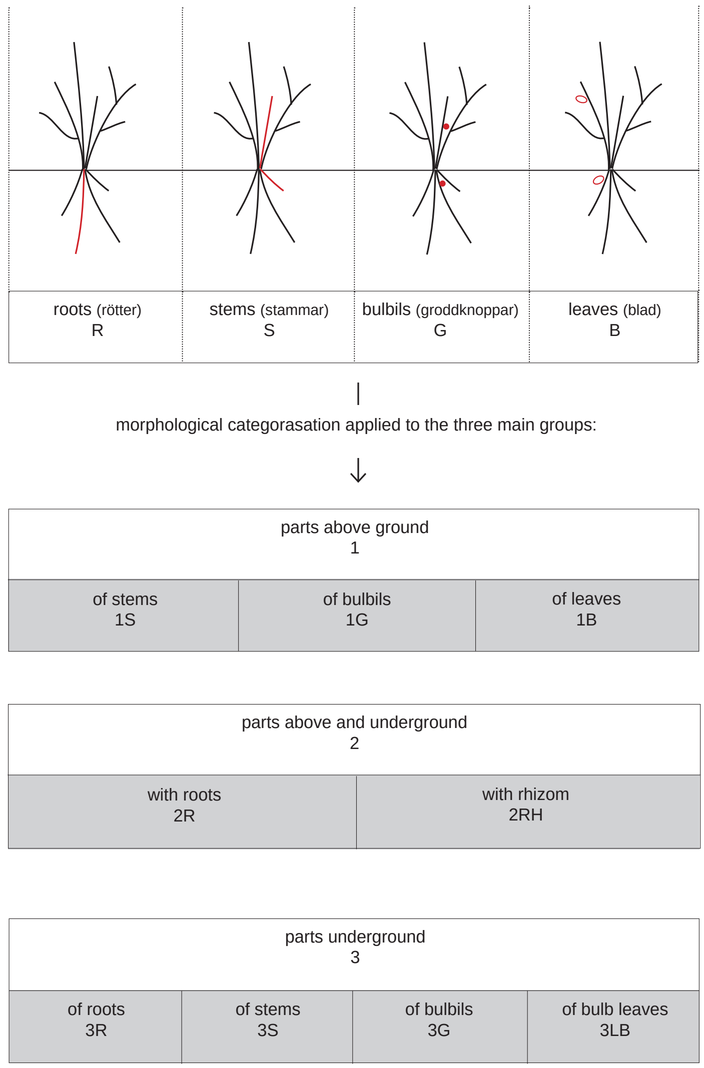

Figure 3: The second level of the classifying system groups plant parts according to their morphological belonging. Stems, bulbils, and leaves are represented both above ground and underground. The numbers and letters form a code system that can be used to link documentations in the system. Image from Westerlund 2017, 78.

in relation to the ground surface (Raunkiær 1934). The reason why I think his system is useful is because of the similarities with the conditions in the propagation practice, where the plant parts used are in different stages of development, and are therefore situated both above and under the ground surface. With this first level, differences in the propagation practice can be grouped according to where the plant parts are located in relation to the ground.

Although various aspects of where the plant parts are situated in relation to the ground surface have been taken into account in horticultural categorisations before, it has not been the first level of a grouping (cf. Bailey 1922; McMillan Browse 1999). The advantage of having these three groups as the first level is that propagation parts from all types of perennials can be sorted without being affected by other group belongings, such as plant environments or plant genera.

In the next level, the grouping of plant parts consists of morphological belonging (Figure 3). In this grouping, the starting point is the common classifications of botany, for example roots, stems, and leaves. To arrive at the final groups, which relate to the propagation parts, another one or two levels are needed. In these levels the plant parts are grouped according to further differences, like size or location at the plant.

The grouping itself gives a description of the appearance, structure, and location of the different propagation parts. It can be clarified further by adding examples. In addition, it is also possible to add explanations of the biological qualifications and cultivation conditions.

The final grouping into 32 categories of propagation parts consists, figuratively, of 'boxes' into which documentations with descriptions of propagation methods can be sorted (Figure 4).

Descriptions can be mediated in various ways depending on documentation media, such as film clips, text, photographs, and drawings, to visualise the steps in propagation procedures. Descriptions from propagation procedures of different plants can then be sorted, as well as examples of practice from different situations. With this system it is possible to search through the various levels and groups by making comparisons. This is a tool that makes it possible to perform comparisons similar to those that the experienced gardeners perform in their 'inner systematisation.'

TESTING THE CPP

Next, I will show an example of how plant parts and propagation methods can be sorted into the CPP. To do this, a case study using documentations of propagation of the shooting star flower (*Dodecatheon meadia*) (Figure 1B–C) will be presented and tested in the system. The flower has its origin in America, but it was already cultivated in Sweden at the time of Linnaeus, in the eighteenth century. The documentations are the result of interviews, observations, and participant observation at a perennial nursery, as well as comparisons of descriptions in literature and a propagation test.

My experience is that the shooting star easily dies away unless the cultivation conditions are right. To preserve it, the plants need to be propagated regularly. Like many other plants, it can be propagated using a variety of vegetative methods. The choice of method affects when the work is carried out, depending on the stage of development of the plant. One method is to propagate it with roots.

Participant Observation

The first time I came into contact with vegetative propagation of the shooting star was at Djupedal's plant nursery outside Gothenburg. Carina Ljljebladh, an employee at the nursery for many years, main group 1

<table>
<tr><td colspan="14">parts above ground
1</td></tr>
<tr><td colspan="7">of stems
1S</td><td colspan="3">of bulbils
1G</td><td colspan="4">of leaves
1B</td></tr>
<tr><td colspan="4">detached from mother plant
1S1</td><td colspan="3">attached to mother plant
1S2</td><td rowspan="2">from leaf axil
1G.1</td><td rowspan="2">from leaf
1G.2</td><td rowspan="2">from flower
1G.3</td><td colspan="2">whole leaf
1B1</td><td colspan="2">section of leaf
1B2</td></tr>
<tr><td>stem tip
1S1.1</td><td>stem section
1S1.2</td><td>basal shoots
1S1.3</td><td>shoot with heel
1S1.4</td><td>layering
1S2.1</td><td>mounding
1S2.2</td><td>shoot on runner
1S2.3</td><td>without dormant bud
1B1.1</td><td>with dormant bud
1B1.2</td><td>pinnate veined
1B2.1</td><td>parallel veined
1B2.2</td></tr>
</table>

main group 2

<table>
<tr><td colspan="8">parts above and underground
2</td></tr>
<tr><td colspan="5">division of plants with roots
2R</td><td colspan="3">division of plants with rhizom
2RH</td></tr>
<tr><td rowspan="2">of horizontal roots
2R.1</td><td colspan="2">of adventitious roots
2R2</td><td colspan="2">of primary roots
2R3</td><td colspan="2">with terminal shoot 2RH1</td><td rowspan="2">with several shoots
2RH.2</td></tr>
<tr><td>with single shoot
2R2.1</td><td>with several shoots
2R2.2</td><td>with single shoot
2R3.1</td><td>with several shoots
2R3.2</td><td>shorter than 10 cm
2RH1.1</td><td>longer than10 cm
2RH1.2</td></tr>
</table>

main group 3

<table>
<tr><td colspan="10">parts underground
3</td></tr>
<tr><td colspan="3">of roots
3R</td><td colspan="3">of stems
3S</td><td colspan="2">of bulbils
3G</td><td colspan="2">of bulb leaves
3LB</td></tr>
<tr><td>with horisontal root
3R.1</td><td>with tap root
3R.2</td><td>with tuberous root
3R.3</td><td>of bulb
3S.1</td><td>of corm
3S.2</td><td>of rhizom
3S.3</td><td>without a stem
3G.1</td><td>on a stem
3G.2</td><td>whole with dormant bud
3LB.1</td><td>without dormant bud
3LB.2</td></tr>
</table>

Figure 4: The Classification of Propagation Practice (CPP) in its entirety, with its three to four levels which lead to 32 groups of different plant parts that can be used for vegetative propagation. The numbers and letters form a code system that can be used to link documentations in the system. Image from Westerlund 2017, 81.

told me that they had worked with the root propagation one and a half months earlier, "when the new side shoots look like white teeth."[4] She showed me that a plant consisted of a "mother's shoot" in the middle, with several side shoots close by. When the propagation is performed, the shoots are more like buds and can consist of a total amount of between 10–12 side buds. By loosening a side bud together with a root, the resulting plant part can develop into a new plant. Carina said: "It's like wiggling a loose tooth, and it says 'click' when it breaks off."

Carina also said that it is sometimes difficult to get the bud and root to come loose. In such circumstances, a stronger movement is required when wiggling, the clicking sound is not as distinct, and more roots are damaged when they are removed. Her interpretation is that the plants have then grown too much and that this method is no longer functional at that stage. By sharing her judgement, describing both the haptic feel and the sound, she gave me a description with a relative time indication for when the method works.

Some years later, at the end of February, I visited the nursery again to be involved in the propagation of the shooting star. Jonas Bengtsson, the owner of the nursery, showed me how he handles the plants (Figure 6). I observed the different procedures and actions, and filmed while he was working. I then tried the process myself. I shook the plants free of soil and wiggled the roots to see which root was associated with which bud. Now I understood Carina's metaphor of a loose tooth. I wiggled it so that the part detached from the plant with a clicking sound (Figure 8). In the next step, we planted each root one by one into pots, together with a bud, and filled them with soil.

While we were working, there were some roots that were broken off. None of us knew whether the pieces could develop into new plants. I took them with me and made my own propagation test. After eight weeks, none of the pieces had developed any new shoots, so the test was ended. The fact that plants from certain families and specific species can be propagated with pieces of roots is well known, and a variety of methods are documented (cf. McMillan Browse 1999; Hartmann et al. 2002). In the most common method, roots can be cut into several parts, where each root part can develop new shoots and become a new plant (3R.1 and 3R.2 in CPP, see Figure 5). I had not read about this method of removing roots with a bud at the top before.

Comparisons of Descriptions in Literature

Descriptions of the propagation of the shooting star can be found in horticultural literature. Sometimes it is noted in the records and lists without any mention of propagation by roots (e.g., Hartmann et al. 2002, 821). Some sources say that propagation by roots is a possible method for the shooting star, but it describes neither what the part of the plant looks like or how the procedure is done (e.g., Jagne 2006, 117; Lorentzon 1989, 261). A few sources refer to methods which are similar to those used at Djupedal's nursery, but they are described in very short terms. One example is from Bailey:

> Cuttings of the whole root can be used effectively, the root being torn off the crown, planted upright, and covered with the sandy soil commonly used in this form of propagation. (Bailey 1911, 228)

Other documentation consists of short notes where both buds and roots are mentioned, without describing the procedure (e.g., Månsson and Johanson 1994, 122; Thompson 2005, 200; Toogood 2006, 195). I found a more detailed description by Blanchette, a nursery man who described an almost identical version of the method to that used at Djupedal (1998, 328–29).

Figure 5: From the left: Blue Eryngo (*Eryngium planum*) is a genus that can be propagated by cutting the roots into pieces. A common recommendation is to take roots as thick as a pencil and put them vertically into a sandy soil, with the top of the root piece in the soil surface, before covering with a layer of grit. The result in a propagation test shows that shoots can develop from root pieces without visible buds. Photographs by Tina Westerlund.

Placement in the Classification System

Into which category of propagation parts in the CPP can this method for the shooting star be placed? I shall now discuss this question based on what has emerged from the case study.

The propagation is performed when the plant does not have any active parts above the soil surface. The first level in the classification system is thus to determine propagation with *underground parts* (the third group of the CPP). Morphologically, the underground parts are roots. This gives the next level in the classifying system, as the propagation is performed with plant parts that originate from *roots* (see Figure 4, group 3R). Roots are then grouped into three different categories of propagation parts: 1) those which grow horizontally and which naturally develop new shoots along the roots; 2) roots that grow with a downward direction into the ground, and which can develop new shoots only when they are damaged or separated from the plant; 3) the roots that are swollen—so-called tuberous roots—where a bud must follow to allow the root piece to develop a new plant.

My experiences from working with the shooting star plants are that the roots have a downward direction and are not particularly swollen. In a first attempt, I therefore chose the group *parts of descending roots* (see Figure 4, 3R.2) and asked: Is this the right category? In the general descriptions of root propagation in the horticultural literature, I did not find anyone who addressed this variant where a bud at the root top was needed to succeed with the propagation. The propagation test, where I used root pieces without visible buds at the root tops, was a way to try to get an answer. While my test did not show any successful results, this does not necessarily mean that it cannot work. However, this result, and the practice at Djupedal's nursery, does indicate that the way to success is to use root pieces with a visible bud at the top.

The practice shows that this propagation method best fits into the category of *tuberous roots* (3R.3). This placement explains that a following bud is a prerequisite for a functional propagation method, although the shape of these roots does not resemble most of the other examples that can be sorted there (Figure 8).

Reflections on the Propagation Test

The case study of the shooting star shows that the propagation method used at Djupedal's nursery is known but is rarely described. This is one example of a practice that is linked to a special variant of a propagation part. It is also an example of how vital knowledge in propagation practices risks being left out when descriptions in horticulture literature are generalised. The test shows that the use of the CPP could draw attention to differences in propagation parts and to how these differences affect the practice. By building a hierarchic system of the plant parts used in propagation, the systematisation resembles the gardener's 'inner systematisation.'

The CPP is built on observations of the form of the plant parts and their different stages of development, but also from experiential knowledge about the outcome of different propagation methods. As described, the shooting star can be propagated by roots, but it can also be propagated by division when the leaves have developed. In the latter case, it is sorted into another group in the system (2R2.1). Unlike systems where the descriptions of methods are sorted into lists according to the name of the plant, this system increases the chance of discovering connections between methods of propagation and various plant forms. In fact, the name of the plant does not even need to be known; instead, a

Figure 6: At Djupedal's nursery, Jonas Bengtsson is moving the roots of the shooting star to see which bud is moving. Click the image to see the video if reading a pdf version, or scan the code to the right, or go to: https://youtu.be/Re4rr5k3M4c. Photograph and video recording by Tina Westerlund

Figure 7: The propagation part of the shooting star, a root with a bud at the top, has been detached from the mother plant. Photograph by Tina Westerlund.

main group 3

parts underground 3					
of roots 3R			of stems 3S		
with horisontal root 3R.1	with tap root 3R.2	with tuberous root 3R.3	of bulb 3S.1	of corm 3S.2	of rhizom 3S.3

Figure 8: At Djupedal's nursery, they propagate the shooting star at a time when the plants do not have any active parts above ground. The plant parts used are *roots*. This gives the two first steps in the classifying system (3 and 3R). By comparing the method used at the nursery with other variants of root propagation, it is possible to see that the roots do not grow horizontally. At least one bud at the top of the root pieces is a prerequisite for the propagation parts that I have grouped as *tuberous roots* (3R.3). Image by Tina Westerlund.

hierarchic system with examples gives guidance. By sorting this example into the classification system, it is possible to make comparisons and ask questions.

If the classification system is translated into an open-source database, it becomes a tool for many users. A database for propagation practice can be used both for teaching purposes and as a communication tool between professional gardeners. New information can gradually be registered as it emerges. The step-by-step arrangement of groups also makes the CPP possible to rebuild, and allows for the renaming of groups. The addition of the root propagation of the shooting star shows that the name "tuberous roots" isn't perhaps the most significant group name since it seems to be the buds that are important and not the swollen root form. If new categories are needed to describe differences in the propagation practice, more groups can be added and specified, and the system improves iteratively. However, too many groups may lead to a system that is hard to navigate. The number of 32 groups of propagation parts can be discussed, but it shows a way of building a tool that has the ability to communicate documented knowledge in plant propagation in a systematic way. To enable the system to handle a great diversity of plant forms and variations in propagation practice related to that, examples must be added to the groups. With the ability to combine information, the classifying system becomes a tool that can provide answers and formulate new questions.

Participating in the work at the nursery made me pay attention to a special practice in propagation that forms an important part in the development of the CPP.

The communication at the nursery showed a need for the development of narrative documentations. The gardeners told me about what they did, but they did so in ways that were not only verbal; gestures, identifications, and comparisons were also part of the communication. The video of Jonas Bengtsson working shows the handgrips and the movements, but it also makes it possible to distinguish the clicking sound that he could not have told me by words, nor could I have documented it in writing. This kind of representation is an important part of knowledge development, and with a classifying system like the CPP, video recorded narratives and verbal accounts can form part of a knowledge-forming structure.

THE CONTRIBUTION OF SYSTEMATISATION IN CRAFT

If documentation is to function as a way of safeguarding knowledge, as pointed out by the *Convention for the Safeguarding of the Intangible Cultural Heritage* (UNESCO 2003), it must be done in a way that is useful for others, as a form of guidance in their practice. To meet the complexity inherent in craftsmanship, the development of good documentation methods is important in research on practice. One challenge lies in capturing the practical knowledge, another in making the documented information available. An individually represented documentation of a craft situation can be valuable in itself, but to be part of a knowledge-forming structure, it must be sorted into a context. As said earlier, Schön reminds us that practical knowledge is built up like "a repertoire of examples, images, understandings and actions" (Schön [1995] 2003, 138). I have taken this statement literally in my own research, creating a tool for sharing such a repertoire with others. When documentation is systematised, the communication of knowledge can be built on the experiences of many different people. In this chapter I have presented a method for systematically collecting, and communicating, documented craft knowledge—in this case, the craft of propagating perennials with vegetative methods.

The classification system is based on a knowledge perspective where practice-oriented theories, descriptions, and explanations of practical knowledge are linked to the objects involved in the practice. The chosen objects are the plant parts used in vegetative propagation. With an object-oriented perspective these can be described as the "most fundamental components of reality" (Molander in this anthology, 377). The hierarchic system in the CPP makes it possible to group and describe plant material despite there being a great diversity in plant forms and therefore many variants of practice in making new plants. This system enables a gathering of documented experiences, despite the influence of personal choices and adaptations to different practices. It allows the possibility that personal knowledge can become more general and useful for others (cf. Polanyi 1958).

The systematisation is the result of a craft research methodology, where the craft practitioner perspective is needed both to formulate questions and to pay attention to what is important in knowledge communication. In this chapter, I have demonstrated how the researcher's own practice is used as a method for delving deeper into interpreting and evaluating craft documentation. If empirical knowledge of specific craft areas is used to inform systems of classification, not only will this create a hive of relevant information, but it is more likely that the systems devised will be useful for the practice field. Even though there can be similarities in documentation methods relating to practical knowledge, each craft has its own conditions that direct the way in which documentation can be systematised. The point of departure could be the differences in the attributes of the material used (cf. Källbom in this anthology), or it could be built on the result of a craft procedure, for example different models of boats, interlock techniques in a tapestry, variants of joints in timber framing, or a shape of a hedge (see the respective chapters of Leijonhufvud, Holmberg, Hjort Lassen, and Seiler in this anthology). The systematisation could also be built on the words used within a craft. One example is the family tree of words used in metalcraft, where the verbs that describe different metal craft activities are categorised to communicate knowledge in practice (see Thane in this anthology).

If crafts can be systematised in this way, there is a potential to build databases and applications to which information can be added and made available to many users. Such a tool would make it possible to take part in a comprehensive and varied knowledge base, such as a recorded story, a relative time indication, or a video clip. However, it is not just about collecting information; it also implies making that information available for further processing. Craft research is not just about learning from practice but is also about adding new knowledge to practice. With better conditions for exchanging experiences, knowledge development increases. When documentation becomes available, it can be used as a basis for discussion. Not only does this provide craftspeople with opportunities to communicate and develop their knowledge; it is also a way of demonstrating the importance of this knowledge for other occupational groups—groups that can influence a continued demand for practice. In relation to plant propagation, I believe such communication provides an important strategy in safeguarding the knowledge that is needed to maintain garden practices, such as those used in sites like Linnaeus's Hammarby.

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ENDNOTES

1. Through plant breeding, one tries to combine the properties of different plants to develop new ones. When this material is to be propagated, genetic copies are desired and so-called vegetative propagation can be the only way to achieve this.
2. Linnaeus's flowerbeds, in front of the house, were reconstructed by Rutger Sernander in 1928 (Manktelow 2008). They were reconstructed during the 1990s and again before the Linnaeus anniversary in 2007 (oral information, Jesper Kårehed, December 2015).
3. Oral information, Roland Törnqvist March 2009, Ulla-Lena Wiik, April 2010.
4. Carina Liljebladh, April 2010.

EPILOGUE

The last chapter in the book is a reflection by philosopher Bengt Molander on the concept of theory as an idea, a term, and rhetoric. Theory is an ambiguous concept with different meanings and uses in scholarly society. Molander seeks to enable a concept of craft theory that is essentially developed through craft practice and studies of craft practice emanating from this practice itself. The text has been previous published in Swedish.

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Freedom of Thought and the Longing for Reality: About 'Theory' as an Idea, a Concept, and Rhetoric

By Bengt Molander

> After having read 73 poems about flight and
> about wings,
> I want to pay tribute to the soles of my feet,
> my downward-facing soul, the art of stopping
> and having weight …
>
> Werner Aspenström[1]

INTRODUCTION: BETWEEN FREEDOM AND REALITY

We can sense the full weight of facts, experiences, 'what is', what roots us in our reality. At the same time, we can think freely about what reality (with or without quotation marks) can be at its most fundamental. Humans have created the most fantastic theories about the reality beyond or beneath our experience. Not everything is what it seems. Not everything can be seen. And reality changes.

The current concept of theory is linked to freedom of thought and creativity. Theories are hypotheses. The concept of theory is also linked to order and systems. This is particularly true of scientific[2] theories. When the concept of theory became a separate basic philosophical concept—philosophy in the sense of the search for wisdom—it was primarily linked to the human ability to make contact with and connect to a reality beneath the multiplicity of experience. This is also true of the contemporary concept of scientific theory. This is where we will start.

I quoted above a few lines from Werner Aspenström's poem "Icarus and the Rock." Icarus is a figure in Greek mythology. He was the son of the artisan and artist Daedalus and he tried to fly away from captivity on Crete using wings that his father attached to him using wax. However, he failed to heed his father's warning about flying too close to the sun. The sun melted the wax and Icarus fell into the sea and drowned. The myth is about human hubris and overestimation of oneself. Werner Aspenström leaves this in the background and creates a tribute to the soles of the feet instead. They root us to the ground but are also part of our thought processes, our "soul," as Aspenström says.

I see this duality as part of the dialectic of the concept of theory. Theories allow us, to a certain extent, to free ourselves from 'what is'. But our thought processes have another side. They exist in our hands and in the soles of our feet, in "the art of stopping and having weight," and in the art of carrying on.

This anthology is a multifolded exploration in craft sciences. The authors of the chapters are practitioner researchers in different craft fields but with a common interest in finding context appropriate theories and methods. This epilogue about the notion of theory is a contribution to craft research from a philosopher's perspective. Together with the contributions from the practitioner researcher, it shows that 'theory' and practice need not be separated in the development of craft sciences.

ABOUT THE METHOD

My objective is to provide a description of the landscape[3] of the concept *theory*. The aim of the description is to find and highlight principal meanings, or rather principal ideas, that lie behind different uses of theory, in the sciences and, to a certain extent, elsewhere.[4] Some philosophers love definitions. Others, including the author of this essay, love to find new and alternative terms and to approach the old ones from every angle without ever deciding conclusively what *theory* means.

Many discussions about theory start from an assumption that the concept is, or should be made, precise and unambiguous. I do not believe that this is correct. Consequently, one important objective of this essay is to try and blur the boundaries of the term, set it into motion—i.e., to show that it is already in motion and is neither precise nor unambiguous.

One particular objective is to contribute to, or at least enable, a concept of craft science—and craft theory—that is essentially developed through craft practice and studies of craft practice emanating from this practice itself (and not just through 'external' observation).

The method is a matter of writing: to write a text that gives an account of what theory can be, based on many years of reading and listening—and academic life. It is therefore a matter of *writing a text* that has both focus and a reasonable breadth. Writing a text is also about reading, taking a break, reading again—and rewriting. Trying out different terms and formulations.[5] The views of other readers are important. But the method is to write *my* text and thus find out where I stand. This is essential if I am to have something to say to others. The text is for you, dear readers.

IN THE BEGINNING WERE THE SPECTATORS AND THE SPECTACLE

The concept of theory has an interesting history which is not unambiguous or easy to understand from a present-day perspective.[6] The word *theory* derives from the Greek *theoria*, which, in the ancient world, had meanings related to witnessing, beholding, seeing, contemplation, and reflection, often 'internal' seeing through the soul or the mind. The entire area of understanding and insight is full of words linked to sight and seeing. We see clearly and we are enlightened. Strictly speaking, there is no boundary between the more metaphorical and the less metaphorical.

Plato made *theoria* a special concept in his philosophy. He co-opted parts of an older, almost religious concept of *theoria*. A *theoros* (i.e., a theorist) was an envoy sent from a Greek state (city state) to another place to attend a religious festival and then return home and report on it. Being a spectator, then, also meant taking part in the divine proceedings. This meaning may 'theoretically'—through freedom of thought—be disengaged from its religious and historical context. Then, the theorist is the foreigner, who comes (sent) as a spectator to a foreign reality from which he or she is to return home and report on (cf. below about alienation through theory). Hans-Georg Gadamer says that the right place for hermeneutics is "between strangeness and familiarity" ([1959]1988, 76).[7]

For Plato, however, *theoria* stands for insight into reality, which, for him, means an (intellectual, spiritual) observation of the eternal, unchangeable objects—the ideas. Through *theoria*, the theorist, the one who has achieved wisdom, comes to see (the real) reality, the divine. The allegory of the cave in *Republic* speaks of divine contemplation. This is also a contemplation of the whole. It is difficult or impossible to modernise this concept of theory and disengage it from the rest of Plato's perception of reality.

In Aristotle, *theoria* came to be associated with science—theoretical science. Theoretical science means knowledge of the unchanging, of first principles and causes, of what could not have been different. In addition to theoretical science, he included practical and poetic sciences. 'Poetic' here is related to creative activities such as crafts. 'Practical' science is about gaining insight and achieving a good life. *Theoria* is the activity of reason, which mankind shares with the gods. For Aristotle, the theoretical life, *bios theoretikos*, was also the highest form of practical life. *Theoria* means here a contemplative form of life that is an expression of and leads towards the highest form of wisdom (*sofia*).

In the ancient world and in the Middle Ages, a contemplative concept of theory was dominant. Theory meant beholding the truth, which was often interpreted in mystical terms. Later, theory has been linked to various structural means of summarising experience, creating intellectual unity, and enabling a mastery of nature. Theory came to be associated with hypothesis only in the seventeenth century. In the eighteenth century, the term became more and more diverse and it lost some of its character of higher or privileged insight. For example, it was possible to talk about the theory of the art of gardening.[8] This brings us closer to the current, more open, concept of theory, which is not always so open. In the notion of scientific knowledge, it has both become more closed and has received a new elevated status.

I have taken more current meanings of the term *theory* from the biggest, most comprehensive English dictionary: the *Oxford English Dictionary* (*OED*). The extract is provided as an appendix to this essay. The meanings are collected here as, on the one hand, various understandings and explanations of various phenomena and, on the other hand, understandings of and principles for how one should act in various contexts. Theory may stand for a speculative hypothesis, but it may also stand for a system of explanations that have been tested against facts and have been shown to be robust, which does not mean infallible. Theory in this sense may sometimes have been elevated to a seemingly infallible faith.

Theory is something with which we organise reality or use to move forward in reality. This is an attempt to summarise the explanations in the *OED* in a simplified fashion. I will now switch to my own structure. (Calling it my own does not mean that it is particularly original. However, it is the structure that I have chosen and is thus 'beyond' true or false.)

THEORY AS CONNECTION—BETWEEN PEOPLE AND REALITY

Theory is usually, particularly in scientific and scholarly contexts, linked to explanation and understanding. Theory, like explanation, may be understood in a more subject-oriented or more object-oriented sense (I would prefer to avoid the terms objective and subjective):

> Theory is a human system of orientation with which we move forward, intellectually and/or in more concrete terms, in the world. It is a system of perspectives and ideas. It is something we carry with us and use for navigation. It also gives us an overall understanding of an area (area of experience/area of phenomena, the 'landscape').
>
> Theory is also designed to highlight (describe) 'the real,' the underlying forces and tendencies (etc.) that control what happens within a specific area of reality. A theory should go beneath the surface of empirical observations and experiences (which reach neither the smallest parts nor the biggest entireties) and present the most fundamental components of reality. Theory in this sense is to depict or represent reality.

These two sides should preferably match or fit together. The Western scientific tradition is based on the assumption or takes for granted that (large parts of) reality can be understood by humans. Georg Henrik von Wright summarises this as follows in his book *Vetenskapen och förnuftet* [*Science and Reason*]:

> The psychological foundations of the science and philosophy of the Greeks can be described as a tacit, rather than an explicit, belief that the power of human thought is able, without the help of any supernatural authority, to comprehend the *logos* of a thing, i.e., its meaning and inherent order. This might be referred to as a belief in the *intelligibility* of the cosmos. It recurs among the Renaissance pioneers of modern science in the form of a belief that "the Book of Nature" can be read by Man, provided he learns to understand the language of mathematics, in which it is written. A belief of this kind, or rather a conviction, that life is intelligible, is the rational foundation on which everything that can reasonably be called "science" is based. This applies both to the science of the ancient world and to our own. (von Wright 1987, 24–25)[9]

This longing both for understanding and to capture reality is evident in most attempts to explain and define theory in the field of science. The following is a good example:

> A scientific theory is an attempt to bind together in a systematic fashion the knowledge that one has of some particular aspect of the world of experience. The aim is to achieve some form of understanding, where this is usually cashed out as explanatory power and predictive fertility. […] Explanation […] is a matter of showing how things happened because of the laws of the theory. Prediction is a matter of showing how things will happen in accordance with the laws of the theory. Most significant is the fact that really successful theories bind together information from many hitherto disparate areas of experience […]. (Ruse 2005)

The first part of the explanation of the term is more subject-oriented, while the latter formulates the requirements a theory must meet for it to be said to match reality, i.e., explanatory power and predictions that are confirmed, and that the theory preferably binds together a number of fields of study.

As we can see, the meanings of theory may be more subject-oriented or more object-oriented.[10] A key concept for both may be connections, as understanding is based on (seeing) connections and on something being explained through connections to other phenomena (facts). Connections obviously have a subject-oriented side and a more object-oriented side. The two sides do not need to be strictly distinct from each other. The subject-oriented meaning may be more relevant when we perceive a theory as being more hypothetical, more like a scaffold for further methodical enquiry. The object-oriented meaning may be more relevant when we think of 'theory as results' of studies.

The last definition quoted above emphasises prediction. It best matches the typical natural sciences, which try to establish (more or less) general theories (laws) about reality. The definition also uses the term *scientific theory*, here primarily with reference to the natural sciences. It might also match well the self-understanding in many areas of technological science. However, it does not match very well the self-understanding of researchers within the humanities.[11]

So far, I have focused on theory as an intellectual or perhaps purely theoretical form of explanation and understanding. We assume the spectator's (or thinker's) position in relation to the world (reality) around us. In many occupational areas and activities, theory means instructions for how to do something. With reference to the *OED*, in the previous section I mentioned "understandings of and principles for how to act in different contexts" as a fundamental meaning. This is not just about an abstract correspondence between understanding and reality. It is also and perhaps primarily about establishing and maintaining connections by making and remaking reality and *understanding* through this making and remaking. Or, put more simply, creating comprehensible reality. This may be true of technological fields, craftsmanship, and much more besides.

Consequently, we have a third focus for theory in addition to the subject-oriented and the object-oriented. We can call it the practice-oriented meaning of theory.[12] In ordinary language and in most contexts, these (pedagogically motivated) meanings do not occur separately. However, when we take a close look at theory in various contexts, we must turn our gaze of enquiry in all these directions.

In the field of craft science, in the sense of science through crafts, I have found few or no direct references to theory in the sense of (a system of) formulated connections. However, there are often references to methods based in established sciences—both the natural sciences and others. This may concern material properties, dating and—very generally—experimental method. The methods are quality-stamped, so to speak, by reference to the *established scientific systems* and the methods developed and refined within them. If we emphasise this relationship with theory, it is easy to classify the field as 'applied' science. However, I believe that this may be easily misunderstood. Certain established (natural) sciences and their methods are applied in virtually all fields of research, at least as aids. Like other fields, craft science applies them and adapts them to *its* questions and investigative approaches. Application thus also becomes the development of new theory.

THEORY AS DEFINITION AND THE ESTABLISHMENT OF A FIELD OF STUDY

Theory may also be used as the designation of a field of study or research, for example 'theory of science' and 'theory of knowledge.' *Theory* may only be used in the singular in this sense. The field of study or subject area is defined by fairly general problems. This is also true of literary theory, when the field is defined as follows in the *Oxford Encyclopedia of Literary Theory* (n.d.):

> Literary theory is the practice of theoretical, methodological, and sociological reflection that accompanies the reading and interpretation of literary texts; it investigates the conceptual foundations of textual scholarship, the dynamics of textuality, the relations between literary and other texts, and the categories and social conditions through which our engagement with texts is organized.

A theory may also be a theory about the field to be studied. The theory determines the 'objects' in that field and how they are to be studied. The objects and what are considered facts are created or co-created by the theory, rather in the sense of a subject-oriented and practice-oriented theory here. In this sense, we can talk about *various* theories of knowledge, theories of science, and literary theories. Let us take a few more examples from the field of literary theory.

LITERARY THEORY

> "Literary theory" is the body of ideas and methods we use in the practical reading of literature. By literary theory we refer not to the meaning of a work of literature but to the theories that reveal what literature can mean. Literary theory is a description of the underlying principles, one might say the tools, by which we attempt to understand literature. [...] It is literary theory that formulates the relationship between author and work; [...] (Internet Encyclopedia of Philosophy, n.d.)

The following relatively simple explanation is a clearer example:

> A very basic way of thinking about literary theory is that these ideas act as different lenses critics use to view and talk about art, literature, and even culture. These different lenses allow critics to consider works of art based on certain assumptions *within that school of theory*. The different lenses also allow critics to focus on particular aspects of a work they consider important. (Purdue Online Writing Lab, n.d.; my italics)

The explanation is accompanied by a long list of different literary theories. *Theory* here means SOMETHING that says what the 'object' literature is and how to treat it in the context of interpretation, criticism, and the mining of relevant knowledge and understanding (cf. the discussion of Gunnar Almevik's use of "theoretical starting points" in the section "Theory in Craft Studies and Craft Reality," below). Without different lenses, we see no 'literature'. The extent to which we are aware of the lenses we use is another matter. Although the above two quotations differ slightly, literary theory typically defines what *literature* is and the methods that can generate *facts* and *knowledge* in the field in question.[13]

There is no given form to which theory in this sense has to be adapted. Consequently, there may be, and there normally are, very different, competing literary theories in the broad field of literary studies. The situation is similar for (general) theories in other humanities and social science fields. Generally speaking, it may be said that literature, literary criticism, and literary studies cannot exist without theory (however, cf. the section below on anti-theory attitudes in science).

I said that theory in this sense generates—"creates"—facts. This means that what is *counted* as a relevant fact in a field of study is determined by theory. Theory in this sense is not tested directly against 'facts' because the theory determines what counts as a fact. *Theory* in this sense may also be called a *theoretical framework*, which may contain basic concepts (technical terms), theories in the sense of basic connections (theories as scientific systems/systems of general claims), and area-defining or at least acceptable methods. It may be said that theory in this sense provides a basic picture of the reality to be studied.[14] With a formulation that is partially inspired by Plato's *theoria*, we can say that we must learn to *see* correctly if a field that is at first foreign is to reveal itself to us.

Theory in this sense is in no way solely the preserve of the humanities and social sciences. It also exists within the most established natural sciences, but it is often more unambiguously determined by tradition and is (made) self-evident via the path to the subject area's knowledge that everyone takes, most often through an academic education.

We started this section with theory as the designation of a field. Now we have arrived at theory in its perhaps most fundamental sense—i.e., the approaches and methods that define the objects and facts in a field. However, this is theory in an extremely theoretical sense. Inspired by Marx's theses about Feuerbach, we may perhaps say here that the world not only needs to be interpreted; it also needs to be changed, *made and remade*—through crafts and in other ways.

There is an even more general sense of theory, where 'theory of' means 'philosophy of' something. It doesn't, however, seem common to talk about various 'philosophies of' craft science; the researchers rather prefer to talk about various 'approaches to' or 'perspectives on' craft science or 'craft studies' more generally. When it comes to craft and craftsmanship, however, there are plenty of discussions about what craft and craftsmanship *really* are and should be, which means that we enter the arena of theory as philosophy. One example is David Pye's discussions in *The Nature and Art of Workmanship* (1968), where his starting point, as a "first approximation," is that craftsmanship "means simply workmanship using any kind of technology or apparatus, in which the quality of the result is not predetermined but depends on the judgement, dexterity and care which the maker exercises as he works" (1968, 4).

Theory in the sense of philosophy is normative; it is a discussion about, and a philosophy of what *good* work or *good* professional conduct is. It is not part of my topic here to go into either the philosophy of craft, craftsmanship, or craft science. We turn instead to studies which distance themselves from at least object-oriented theory in the form of general statements.

BEING IN REALITY AND TALKING ABOUT IT—WITHOUT THEORY

Not everything is theory. As people, we have a fairly immediate relationship with the world closest to us and with other people. We tell others about events and explain by adding to and elaborating on what we say in various ways. We can understand others' narratives immediately in virtue of sharing a language and common human experiences.

In the humanities, movements that reject theory have primarily focused on description of particular cases and individuals as well as the ability of people to understand the inner world of others, often in combination with each other. They have primarily rejected theory in the sense of general connections.

The latter parts of the nineteenth century and the early twentieth century are a key period in the emergence of modern humanities and social sciences. Humanities were and were identified primarily as historical sciences. A pair of terms derived from discussions in German philosophy and historical studies which is still able to provide a basic model for understanding various fields of science is *idiographic* and *nomothetic* studies. *Nomothetic* means establishing laws, and it was thought that typical natural sciences aimed to establish laws (general theories) on the basis of observations and experiments. The humanities (i.e., historical studies), it was thought, were typically idiographic—that is, they were descriptive of the individual. They describe (individual) works, cultures, periods, events, and courses of events, and human individuals for that matter.

The clearest idiographic theory of science (in a wide sense) was in *historicism*.[15] According to historicism, it is not possible to generalise from one historical event to another. Knowledge about a historical event (a work) must instead be based on studies of sources linked to precisely that event (the work). People should essentially be understood as historical beings, not as natural phenomena in the meaning of the natural sciences. History is therefore seen as the most fundamental of all sciences.

The most fundamental path to *understanding* in the natural science (nomothetic) field was to see how natural phenomena exemplified general patterns, i.e., *explain* them with general laws. The idiographic sciences were based on *understanding* the individual, ultimately on understanding other people—their actions and works. This understanding is still usually defined using the German word *Verstehen*, but it is nothing other than normal human understanding of other people. However, this must be systematised and used methodically.

Hermeneutics was a dominant source of philosophical elaborations ('theories') of understanding and interpretation as methodical tools for understanding. The relationship between the part and the whole determined by the hermeneutic circle is central to interpretation and understanding here. This says that understanding of a part, for example of a work, must be achieved by understanding the whole of which it is a part (the whole work, an author's works as a whole, etc.). This is about identifying or extracting *meaning*, not arriving at general claims. The most important proponent of this school of thought in the late nineteenth century was Wilhelm Dilthey, who also extended the range of hermeneutics to all humanities and made it, or tried to make it, a general doctrine of interpretation for all human expressions. Dilthey was both a hermeneutician and a historicist.

Other schools focused more on the historical learnings and interpretative ability that could be acquired by *being trained* in and developing through experience, without theory. In this way, you could become an expert in historical (re)construction.

However, you do not need to be an "-ist" or "-ian" of one kind or another to argue that descriptions, analyses, and the understanding of individual events, courses of events, and works, and not general theories, are the primary objective of research in the humanities. I have previously mentioned our ability to understand others, which can be, but need not be, instantaneous or immediate at all. We build understanding through finding objectives, motives, strivings, etc., which often requires no more than normal interpersonal understanding (and a measure of critical reflection). Another essential precondition is the ability of humans to agree on why someone acted as they did. We can establish consensus on our own and others' "expressions of life," to quote Dilthey.

Much of our understanding of others and their thoughts, deeds, and activities is communicated through narratives of various kinds. Context is based on and may be explored through narratives. Narratives may be seen as a fundamental way of understanding and expressing connections that cannot be reduced to other forms.

I have now presented a few perspectives on science (in a broad sense), all of which reject the objective of establishing general theories. However, the relationship between a theory-free account (or narrative) and the underlying research process represents an important question. In history and several other of the humanities, there is a tradition of writing not only for specialists but also for a broader public. Have authors in their writings simply dismantled their theoretical scaffolds? I cannot look further into this question here, but it is clear that many humanities subject areas and some social science ones have an idiographic *style* in their published works in the broadest sense of the word. They talk freely about sources and empirical evidence, but rarely or never about theories and models. They have a narrative form, sometimes in the form of a travel narrative with a narrator visible in the text. We are invited along on the journey, on which objects are pointed out and placed in a historical framework with an origin, development, and perhaps change.

I will conclude this section by taking a step back and looking at some of my starting points for this account. I assume an opposition between the individual and the general, and these alternatives are also presented as exhaustive. As a consequence of this, the idiographic and nomothetic ideas of science become the only two (well-defined) alternatives. The oldest of all scientific methods is to divide in two, and this is also the oldest and perhaps most tried and tested of all philosophical methods. But neither life nor the sciences are quite as simple as that. I will now complicate the picture. It concerns more or less general *interpretive frameworks*.

What is theory in the form of general interpretive frameworks? It falls outside or between the meanings I have used in my overview thus far. I have assumed a contrast between theory as a (subject-oriented) orientation system and a system of general connections in reality: object-oriented theory. This classification is based on a subject-object relationship between researcher and research subject that has been questioned in the field of humanities. For example, the best-known hermeneutic philosopher, Hans-Georg Gadamer, describes the relationship between researcher and research subject as a dialogical relationship between two subjects. My third interpretative option, the practice-oriented one, may be understood instrumentally in a subject-oriented kind of way. It may also be understood dialogically. For example, both material and tools may *talk back*.

Most examples of studies in the field of craft science that I have seen are more or less comparative. Making systematic comparisons means starting out by typologising, finding typical or common (human, cultural) expressions in time and space, and thus building up explanatory contexts. Buildings, craft procedures, ways of gardening, etc., are thus charged with a meaning that contributes to (increased) understanding and thus explanation. This is the generation of meaning, which therefore also contributes to generating—not just establishing—facts of certain types (cf. the discussion above on theory as the defining of a field of study).[16] Such typologisation primarily means developing (building, modifying) *suitable concepts*, as opposed to looking at correlations that are shown through given (chosen in advance) concepts (cf. the last section below).

The dividing line between idiographic and nomothetic research strategies is a fairly blunt instrument. It is possible to find relatively pure examples of both types of scientific strategy. But in the field of cultural and social sciences, there are forms of generalisation and universality that do not properly fit in. Examples are the insertion of activities or phenomena into more extensive processes/trends/wholes, for example general historical development processes; arranging under national or nationalist objectives; applying modernity theory and other extensive 'social theory.' This is theory that both sets limits and extends interpretations (cf. the section on critical theory below).

THEORY AS HEADING AND RHETORIC

Applications for research funding and scientific articles are generally required to have a theory section, often under the heading "Theory" or "Theoretical Framework." Exactly what this is expected to contain and the standards that apply may vary. A theoretical framework (usually) includes:

- a conceptual framework, indicating and explaining, where necessary, the most important concepts; [17]
- the theoretical perspectives used to formulate the research problem, often in the form of references to central works;
- the methods one uses to arrive at a result.

In an empirically dominated study, the theoretical framework may stand for almost anything that is the starting point or background for the empirical study. It may include references to theory that are particularly important for the choice of empirical evidence and methods (and design). If something is part of the standard repertoire in the research field, it does not need to be stated except perhaps extremely briefly. In theoretically dominated subjects and research fields, there is often a fairly extensive theoretical framework that is accepted by most.[18] A detailed description of your own framework is only required if you are deviating from this.

In summary, theory as framework can stand for any (important) starting points for a study. By using "Theory" and "Theoretical Framework" as headings at the right place in a text, you also show that you are part of the scholarly community. You have dressed appropriately to be accepted in the right salons. I call this *rhetoric*, a term which I am using in a broad but not derogatory sense. This includes all use of words to achieve the desired effect in social contexts.[19] It also sometimes includes exercising power and resistance to (others') power. It is not wrong to use rhetoric!

It is possible to exercise power by condemning others for not having any theories or not having achieved a theoretical level. Power may also be exercised in the opposite direction, for example by accusing someone of having nothing but theory. Claims of these types are often intensely context-dependent and there is therefore no reason to start an abstract ('theoretical') discussion on all sorts of potential interpretations here.

I will take an example of (good) rhetoric from the field of building history and conservation from Gunnar Almevik's thesis *Byggnaden som kunskapskälla* (*Buildings as a Source of Knowledge*) (2012). Chapter 2 of this thesis has the heading "Theoretical Starting Points." It is about various "sources of knowledge" and how they are interpreted, in particular buildings as sources of knowledge. Overarching knowledge and research perspectives are discussed with reference to important people and works.

> In my work, I have applied an approach that is both discursive and phenomenological. In this sense, the theoretical starting point is twofold. (Almevik 2012, 27)

Almevik also discusses "elements of the building history study" and three different perspectives on building history studies (forensic, plurality of sources, actors). Finally, he discusses images as tools for reflection and a scholarly/scientific language.

The thesis proceeds from a study perspective that is not firmly fixed in advance. It therefore becomes particularly important to highlight—and discuss—different overarching perspectives (some would have talked about *paradigms*). It is all very interesting and well written, and it provides the reader with good information. But what makes it "theoretical"?

This word marks a contrast with ('concrete') studies and their results. The "theoretical" is not about practice or empirical observations in research. What it takes up are relatively general starting points. Some of them are rather philosophical or related to theory of knowledge. The chapter is valuable but could equally well have been called "Starting Points." *Theoretical* has a rhetorical function here and opens up for the inclusion of more general basic perspectives, also including a discussion of methods and methodological perspectives.

CRITICAL THEORY—LIBERATING THEORY

Critical theory primarily stands for a critical *activity*. It is about arriving at a critical theory of society that will contribute to a better society. The theory should serve mankind's liberation as a rational, social being, or more specifically, contribute to "man's emancipation from slavery" (Horkheimer 1982, 246 [postscript]). The theoretical—perhaps one could even say *intellectual*—activity should be designed in such a way that it is itself part of the liberation process. Theory here means a subject-orientated system, not an object-oriented system of general claims. We can also say that critical theory is practice-oriented, with the rider that it then concerns political or perhaps politico-philosophical practice.

The term *critical theory* has its origin in the article "Traditionelle und kritische Theorie", originally published by Max Horkheimer in 1937 and translated with a "Postscript" in Horkheimer 1982b. The original critical activity emerged around the Institut für Sozialforschung (Institute for Social Research) after Horkheimer became its head in 1930. Apart from Horkheimer himself, the best-known representatives of the 'school' (the Frankfurt School) are Theodor Adorno and Herbert Marcuse (it is typical for theory in humanities and social science fields to be linked to the names of people and schools). The activity was only able to continue in Frankfurt for a few years as the leading individuals were forced to flee Nazism. Most became active in the United States of America, and critical theory as an intellectual project was primarily held together via the journal *Zeitschrift für Sozialforschung* (*Journal of Social Research*).

Critical theory is inspired by Marxism, and criticism includes critique of ideology. Ideology, in the Marxist sense, means a system of ideas (a 'theory') which is maintained because it contributes to maintaining the (unjust and oppressed) bourgeois society. Let us briefly see what this might mean as criticism of 'traditional' theory and the researcher identity associated with it.

Traditional theory in the social sciences is tested against facts. However, facts may be facts about a society that is unjust and its members may be oppressed in many ways. A (traditional) theory that is well founded on facts and is able to explain other facts in the society thus becomes a superstructure that contributes only to describing and preserving the status quo. The connections established in the form of (traditional, neutral, 'objective') theory will contribute to a picture of what a society *is*, not what it *can become*. Traditional theory can, as an 'objective' tool, be used to rule and control the unjust and oppressed society.

The criticism is also directed at the role of researcher, as perceived in a bourgeois (capitalist) society—i.e., the role as producer of neutral, objective knowledge, which largely also coincides with the researchers' own understanding of themselves. The more 'objective' and the less your research depends on human values, the better the research. This self-understanding is ideological in the Marxist sense. Researchers see themselves as producers of impartial theory, distinct from society in general—as suppliers of facts and fact-based theory. The role of researcher thus also becomes comfortable for bourgeois society, and comfortable for the researcher. However, critical theory researchers see researchers, including themselves, as producers of theory under specific historical and social circumstances. All use ('application') of theory is also an act in the society, a political act.

Critical theory—i.e., critical activity—cannot always produce theories as results. It remains sometimes just critical activity. It remains a radical enlightenment project based on philosophy's traditional belief in a rational society and in liberating and realising (in the society) mankind's reason. It is critical theory's task to do the latter.

An important line of thought that was also developed in the tradition of critical theory, above all perhaps through Jürgen Habermas's works, is that we are unable to achieve genuine knowledge in a society in which people are oppressed. Knowledge, through rational argumentation, requires societal liberation. As I have formulated this here, in extremely general terms, this may sound unrealistic as a concept of theory and knowledge. *Knowledge* is seen here as a societal and political project. It is not traditional.

In a broader sense, critical theory can now mean that oppressed groups are afforded space in the sciences and are able to express their perspectives there, their 'facts,' and their desire for freedom and justice (cf. Bohman 2005). Feminist critique is one example. Research based on the perspective of an indigenous population is another.

Craft science is a young science focusing partly on the values of traditional crafts and, perhaps, a traditional idea of craftsmanship. However, the notion of craftsmanship is inherently connected to values of what good work and good products are, which may go against what is considered as most important by the rulers of the present society or political (academic) culture. A developing craft science must open itself to discussion about whether to be (only) traditional or not.

ABOUT THE BENEFIT OF AND DELIGHT IN THEORY—AND ABOUT THE RISKS

This section contrasts with the previous ones, which primarily aimed to provide an overview of various meanings of theory. The idea behind this section was to say something as generally as possible about why we should seek theory, the benefit of theory in the broadest sense, and the risks inherent in having theory. Now that I have read it again, I see that it is difficult to fit it into the rest of the structure of this essay. I can also see that the term *benefit* mainly concerns formulated theory and that the risks are mainly associated with theory that cannot be seen—i.e., ideas that have always existed or have become invisible with time. Consequently, this section might not primarily concern theory. It might be more about the formulated and the unformulated. In any case, there are a few things that are worth considering in connection with theory.

Here are two quotations that illustrate benefit and risk:

> For sociologists, who generally study their own society, questioning and distancing themselves from taking things for granted is much more difficult than for an ethnologist or anthropologist who studies societies or groups in which he or she is an outsider. There is actually only one way

of achieving the necessary distance from everything you find self-evident, and that is through theory. (Djurfeldt 1996, 16)

> I have more the crude attitude that, if you do not know what reality looks like, it is better to have no map at all than an inaccurate map. If you start to follow an inaccurate map, by definition you are doomed. But if you advance cautiously in unknown terrain, you might make some progress. (Tengström 1987)

However, it is not always easy to know that you do not know! Theories belong in contexts in which we know part of the reality about which we seek a theory. If you know everything, you do not need a theory. If you know nothing, you have no basis for a theory. This places us in an intellectual landscape in which we are sure about some things but have unanswered questions.

Theories are useful because they:

• are means to prevent us from becoming the prisoner of our own convictions. They let us see alternatives, allow us to distance ourselves, and thus to become aware of our own convictions (prejudices). Theories also encourage critical discussion and questioning of 'experience';

• are means for systematising and structuring our experiences and hypotheses, and of comparison with other theories;

• can grasp that which we have no (more) direct access through experience;

• enable (in some cases) calculations and more advanced forms of modelling and simulation;

• are or enable general description and calculation systems that form the basis of predictions, technological development, and experimental methods;

• explain by placing them in general patterns or a context of connections;

• can provide material for the 'mapping' (representation) of a field of experiences;

set free creativity.

We could perhaps also add the benefit of sacrificing hypotheses to save life. The main difference between Einstein and an amoeba, said Karl Popper, is that Einstein consciously seeks for error elimination. "He tries to kill his theories: he is *consciously critical* of his theories which, for this reason, he tries to *formulate* sharply rather than vaguely" (Popper 1972, 25). We can let our theories die, but the amoeba will not survive bad theories, because its theories exist only in the form of its reactions.

The points above mainly concern the methodological side of theories. They are useful methods or tools in studies. They also primarily concern linguistically or in some other symbolic way *formulated* theories.

In terms of risks, it is not the hypothetical-structural or the methodological-critical aspects of theory that come into focus. It is more blind faith in and a boundless love for theory and/or specific theories. Below is an attempt to formulate this in a few points:

• Theories can make us blind to reality—and to other theories.[20]

• Theories and reality get confused; we forget that a theory is a virtual world of belief, claims, and hypotheses.

• We forget that there are important ways of expressing knowledge other than statements and theories, for example action (practice) as an expression of insight into connections—or hypotheses about such connections.

• We forget that an insightful use of theories is a matter of insightful practice, insightful people, and good judgement—not 'more theory'.

• We can have over-confidence in how much reality theories are able to capture.

The jibes here are forgetfulness about theory, theory-generated blindness, and over-confidence in theory, which can all result in alienation through theory. The risks depend, of course, on what other convictions or prejudices people hold. Some prejudices have become established tradition. I will quote myself:

> "Science" and "knowledge" within the academy are usually interpreted in terms of a theoretical tradition of knowledge. The aim is to exercise theoretical control—to nail something into place with well-defined concepts, unambiguous testimony. Knowledge is transformed into a *thing*. As a witness, theory can only address what has already occurred, what is finished, what has already concluded. As a result knowledge in action does not have a chance. This theoretical tradition has basically staked out every "sphere of reality" so completely that it only allows—this is the language of power talking—knowledge formation through (other forms of) theoretically-based specialisation. There are no blank patches permitted on a "map of knowledge" of this kind. Knowledge in action is understood as "application"—or is not understood at all. (Molander 2015, 298–99)

By theoretical tradition, I mean a conception of knowledge wherein knowledge is seen as a formulated or formulatable representation of reality. According to this conception of knowledge, you can have knowledge without being able to apply it (knowledge for its own sake). One of the major risks of theory—I am thinking about formulated or formulatable theory—is that we forget that knowledge is also, and above all, expressed through actions and situational understanding: how to proceed and position yourself in the world. This includes what is sometimes known as *tacit knowledge*.

The critical theory that I introduced above calls itself 'theory' but its main purpose is to provide a counterweight and to conduct a study of traditional theory and its societal foundations. It is not just critical of traditional and bourgeois theory. Horkheimer writes the following in a postscript to "Traditionelle und kritische Theorie":

> A philosophy that thinks to find peace within itself, in any kind of truth whatsoever, has […] nothing to do with critical theory. (Horkheimer 1982b, 252)

Benefit is not just about positive results. The question of the benefit (or not) of theories depends largely on how we distinguish between better and worse theories, a question that I have left in the background and which will have to remain in the background. Here are just a few reflections on this at the end of this section. This is an attempt: good theory is the kind of theory that minimises risks and maximises various aspects of benefit, including all-critical critical theory, with reference to the points about benefit and risk above. But what does 'that kind of theory' mean here? It is perhaps more about the *use* of theory. Theory means nothing in itself. It means something only when people use it.

Two comments on good use of theories. The first, short and sweet, is as follows: It is not enough for a theory to describe and explain what has been. A good theory must also lead to answers to *important* questions and, in particular, lead to *new* good *questions*. This is necessarily a matter of human values.

The benefit of and delight in theory also includes—and this is my second comment—the fact that you can generate theory about virtually anything, even the generation and use of theory in various disciplinary research domains. This can be done in a number of ways. *Science studies* is an umbrella term for all empirical studies of science, both as more 'traditional' theory development and as 'critical' theory development, and for studies that do not fit into any of these designations. The main point now is that both the insider and outsider gazes are important for understanding what a field of study is (cf. the activities of a *theoros* in ancient Greece, as described above). It is not obvious that those working *within* a disciplinary domain always know best—not even those who conduct top-quality scientific studies. Fact-based studies not only produce a lot of 'facts'. They may also contribute general perspectives—theory. Theories may also be freely generated, 'invented'. Both 'proper' mirrors and 'distorting mirrors' may help us see more of and about ourselves. To be able to *see* one's own ideas, norms, and values, it is usually also necessary to be able to see *alternatives*.

THEORY IN CRAFT STUDIES AND CRAFT REALITY

This concluding section is not a summary. I present arguments concerning science and craft and think I can discern a few possible key points in a further development of craft science that is rooted in craftsmanship that actually exists, what researchers in the Gothenburg region like to call *craft reality* [*hantverklighet*]. Take these points as suggestions and starting points for further discussion. In this section, I connect with the traditional field of craftsmanship.

What is science? Science is the collective, organised seeking of theories and knowledge that are as trustworthy as possible. The seeking and the results must be open to criticism and questioning of various kinds. A science—or a disciplinary research domain—must also, if it is to thrive, be developed and continue to produce new results that continue to belong to the domain and continue to interest other researchers in the science. I have previously argued (Molander 1987, 275–80) that science, as a methodologically defined practice, is an important 'internal' definition of science.[21] This remains a good starting point. Research methods that are common within a field and recognised by others are an important stabilising factor in a scientific field. However, this characterisation is far too distanced from the researching, knowledge-creating *people* who carry a practice forward. Science means essentially a qualified understanding and knowledge of the entire spectrum of scientific *practice*: understanding problems, communication and argumentation, use of methods and 'seeing' as a researcher in the field. Thomas Kuhn talks about this in connection with his concept of paradigm as a form of "tacit knowledge" (1970, 44n1, and in the last chapter, "Postscript—1969," 174–210).[22] However, I will not go into the concepts of paradigm and tacit knowledge here. We can only talk about the knowledge and understanding that apply as *researcher proficiency*, which is something more than just *research* proficiency. Research is also professional craftsmanship.

Craft science is a field under development at the Department of Conservation at the University of Gothenburg. I have taken my impressions of this field from the material and people in this department. *Craftsmanship* there is an umbrella term for the craftsmanship in the fields of building conservation, horticultural conservation, and landscape conservation. Craftsmanship and craft products are studied and have been studied in various established subject areas, for example ethnology, art history, and history. It is important for (the new) craft studies to proceed from and be rooted in craft reality, the exercise of craft knowledge, and its associated insight into human life and materials.

Consequently, it must be rooted in both science and craftsmanship. In a draft report on "Attempts to Provide Doctoral Studies Specialising in Craft," Peter Sjömar writes:

> The methodologically theoretical question to which answers are sought is: *Which approaches satisfy both scientific norms and the questions that crafting experiences and problem solving in craft raise*?[23]

I interpret the reference to norms here as requirements for accuracy, critical awareness, and standards for what may be counted as "methods." This is not necessarily problematic. Craftspeople are used to meeting high standards in the performance of their work. However, it is necessary for the scientific community (not 'the science') to be open to expressions other than the traditional, which are largely linguistic. Or, put another way, the scientific community must be open to what I call "practical knowledge traditions."

Scientific fields that, by their very nature, are linked to practical fields outside science must be based on a broad concept of *expressions of knowledge* and *expressions of theories*. Craft may be used to *depict*, *show*, and *demonstrate*—with "express" as a covering term. Of course, this is not about replacing linguistic formulations. It is about expanding and supplementing them. I believe that this process is already in progress, in part through experiments with different types of artistic research. In this connection, multimedia forms of accounts have also become more and more accepted.

I return to the question of the dual anchoring. It cannot be a matter of a craftsperson 'adding' an extra third-cycle programme to learn (others') research methods and express themselves scientifically to meet the requirements of others. There would then be a risk of becoming a theorist (*theoros*) and thus alienating oneself from what is to be studied *through* craft science. Or you try to be an anthropologist in your own practice, which is like trying to lift yourself up by your own hair (or something like that).

In most forms of qualified occupational practice, the common occupational practice will also function as an organ of sight and understanding—sight here as a metaphor (representative) of the sensory forms of perception. This applies to both research and craftsmanship. You see (parts of) reality through your own practice, you might say. This includes the immediate ability to read (with all your senses) reality and the ability to make complex judgements. This is what makes the reference to "crafting experiences" so central (cf. the quotation above). I would prefer to say that craft practice functions as a *medium* for sensory experience (and thought, even theories in fact). Roald Renmælmo says the following in a presentation (which I subsequently received in written form): "Reading and interpreting the traces of a joiner's production process require experience of corresponding work." He also quotes Jarle Hugstmyr, who says:

> I assume that the working methods used by a craftsperson to produce mouldings are linked to procedures that can be explained by technology, understanding of materials and work techniques, and that the work process is thus based on practical sense that it is possible for a craftsperson in the 21st century to understand. (Hugstmyr 2008, 11; quoted in Renmælmo)

You could certainly call what I am searching for "practical sense." Kjell S. Johannessen would talk about intransitive understanding (see Johannessen

2006). It is not necessary to choose one term to cover what I am searching for (what I have written about here comes under theory as the demarcation and establishment of a field of study).

If craftspeople who want to be researchers are to be anchored in craft reality, they have to proceed from their medium, their experience, and their practical sense, and conduct research through this. We may perhaps talk about *grafting* a researcher proficiency onto craft reality. And this may not need to be too complicated. Good craftsmanship is methodical and systematic, and it involves procedures for studying materials, joints, etc. Classifications from occupational experience can be used. Carpenter Tomas Karlsson, who researches planing bench joinery, says in the same presentation as the one mentioned in respect of Renmælmo that he that he works with a "model for description and analysis taken from occupational practice." I will return to models for description and analysis, but we will return to the subject of theory first.

It is obvious that within the framework of craft science we can use or utilise theories (and other things) from other fields of study and research. For example, these may be material properties of various kinds or biological processes. However, what is most interesting is the question of specific (internal) craft theories within craft science. I will quote a long section from Gunnar Almevik's article "Professor i byggnadsarbete. Om erfarenheter av möten mellan handlingsburen och akademisk kunskap" ("Professor in Construction Work. About Experience of the Encounters between Action-based and Academic Knowledge"). The section concerns "Craft Theory":

> Advanced studies may involve assimilating knowledge that was developed in a scientific tradition, for example measuring moisture content and calculating timber shrinkage in a joinery course or studying the chemical process at an aerated lime plant and measuring evaporation and carbonation in a course on mortar and plaster. A seemingly simple way of achieving an advanced level of education would be to stack knowledge of a different kind onto craftsmanship. However, building crafts intersect many traditionally defined and analytical fields of knowledge because craftsmanship is exercised in processes. The starting point in an existing building requires historical understanding. Assessments of damage and measures must be explained. Execution requires skill and coordination requires familiarity. Problems arise because the scientific theories of practice often focus on situations in isolation and disregard all of the complications that are irrelevant to the theory. This is not the case in the practice of theories. An important insight in the work to guarantee the advanced level of the study programme was to not treat theory as anything external to craftsmanship.

An ambitious knowledge target in craftsmanship must entail something more than the ability to repeat a work process in a given situation under supervision. At the same time, it is impossible, in a short programme of study, to include all possible tasks and circumstances in a future full working life. The art of building stairs, for example, is not primarily about cutting and joining strings, treads and risers. Theories about templating, measurement and fitting in joining techniques can be learned in a basic planing bench joinery course. The theory of the art of stair construction lies more in the practical geometry applied in the verdict on the planned staircase's dimensions and angles in the plan projection and as a template for three-dimensional construction. The same geometry is transferable, for example, to the distribution of mansard roof structures. Instead of covering all tasks based on the same craft theory superficially and without reflection, a representative task was selected for more thorough review. One conclusion was that the study programme must seize on the 'internal' theories of the craft and that a high universal level of skills must be achieved. (Almevik 2011, 43–44)

What does "high universal level" mean? The answer may perhaps only be given as a result of successful craft research and not as a theoretical starting point. However, it is not decisive for every research project and every experiment to have such high universality. It is more like a target for the level of scientific discipline that researchers can—and want to—seek to achieve. The precise extent to which the universal is emphasised can also vary across all scientific fields.

What *type* of universality is involved? I have talked about subject-oriented, object-oriented, and practice-oriented theories. These categories are not mutually exclusive. Theories in craft reality must be practice-oriented—that is, they must be formulated in such a way that, as theories (principles, procedural descriptions, etc.), they can be understood and put to use in reality by skilled craftspeople.[24] This means theory that is able to help establish and maintain robust connections between craftspeople and what they work with and on, possibly in a multi-disciplinary setting.

Such theories must also function as orientation systems and thus be subject-oriented. An important part of the development of knowledge within the framework of craft science is also separating the purely subjective from that which is tenable and informative for everyone with (adequate) craft proficiency. This requires that craft studies be organised in relation to the communities of craftspeople, but this is not part of the subject of this essay.

I will take a closer look at the procedures and study perspectives that I can see among craft researchers at the University of Gothenburg, although my account is fairly sketchy. Against this background, as the last topic, I will return to the type of universality and emphasise conceptual generalisation in connection with classification and typologisation.

I have received presentations from five thesis projects.[25] Two of them, linked to building crafts, are primarily historical. Two, which are linked to horticultural craftsmanship, focus primarily on composition and design. The remaining project includes both history and design/composition. The following elements appear central to me:

• Observation and interpretation of practices, materials, tools (reading and interpreting traces).

• Description, presentation, documentation of practices, materials, tools.

• Structuring and typologisation of practices, materials, tools.

• Composition (design), possibly with "dirty hands" (like in gardening).

• Experiments, also in connection with historical studies (reproduction or reconstruction).[26]

These appear to me to be elements of normal scientific work, except that the basis is craft experience and much of the methodical research work takes place through this reality, including materials, tools, and experience—practice as the medium, which I talked about earlier in this section. As anticipated, there are few traces of generalisation in the sense of expressions for general connections. It is more about *discovering and establishing connections*, both hands-on and by developing the *concepts* and terminological tools that already exist as part of the craft reality. Theories here mainly mean interpretative schemes (interpretative perspectives), which are established and generalised to the extent that they may also be used in other cases. This means a practice-based or practice-oriented generality. The classification and development of good typologies are central to this. A few words on this, which I hope may lead to further discussions, will be my last topic in this section and this essay.

Description is never something trivial. A language (with technical terms) is not something that exists in addition to the craft practice. Language and practice are interwoven and no language is isolated. It is possible to borrow from other specialist languages (without forgetting that language is not just an abstract system). It is possible to use Wittgenstein's concept "language game" here, but I mention that purely in passing. All languages also contain classification systems and typologies. It is an important (theoretical) task to develop those that already exist or create new ones that can be incorporated (relatively) friction-free into *the craft language*—and thus also into the craft practice. For me, the clearest example of typology is Tina Westerlund's typology on (and for) plant propagation practice (in this anthology and in Westerlund 2017). Colour theory is also essentially typology. The term typology is *closely related to* theory. This may also apply to typologies of (and for) rebating and the practical geometry of the art of staircase construction (to link to Gunnar Almevik's example in the quotation above).

What is a typology? The general explanation is that it is a form of classification. Typologies of objects are common in many sciences, for example in archaeology, where, for example, lines of influence and development may be mapped using similarities and differences. It is often stressed that a typology must have a scientific basis. However, the topic now is craft science based on craft reality. Typologies must not be imported (ready-made) from other scientific fields. However, it is, of course, always possible to *learn* from people active in other fields.

Relevant typologies are built up based on types of information within an activity and the typologies that already exist in that activity. They often focus on procedures. *Connections* between different 'things' (methods, procedures, results, etc.) are important. A typology must capture the natural—the reality itself—within a field of activity. In respect of craft reality, this means a 'scientific' classification that proceeds from and is firmly attached to this reality.

The general must *emerge from below* through typologisation. It is not primarily general *claims* and *laws* that are established. It is general concepts, which are built up through connections to other concepts and actions. Typologies may very well be practice-oriented. The *language* belonging to an activity is always linked to different action and responsibility contexts. You could say that typologies and connections are built up and rebuilt *within* the language.

Finally, a systematically constructed typology with a reasonable level of universality[27] perhaps cannot just be called a theory. It *is* a theory. And, like any other theory, it can usually be improved.

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ENDNOTES

1. From the poem "Ikaros och gossen Gråsten" ("Icarus and the Rock") from *Dikter under träden* (*Poems under the Tree*), 1956, quoted here from Aspenström (1994, 69). Translation by Katherine Stuart, revised by Bengt Molander.

2. Most of the time I use the term *science* in a wide sense, like the German *Wissenschaft*, which also includes the humanities.

3. On the metaphor 'landscape': a landscape can be described from many different perspectives. For example, that of a walker as they move through and encounter the landscape. Or that of a surveyor. And so on. I see the perspective of the walker as the primary one.

4. I provide few references. The point is not to provide a literature overview but to present a perspective—my perspective—which is based on wide reading and listening over the years.

5. Georg Henrik von Wright writes: "For a writer, an essay is what an experiment is for a scientist, a device for revealing the truth" (1987, 51).

6. I base my approach primarily on the entry for "Theorie" in *Historisches Wörterbuch der Philosophie* (*Historical Dictionary of Philosophy*) and the introductory chapter in Nightingale (2004). Cf. also the etymological introduction in the *Oxford English Dictionary* (see Appendix).

7. We can also say "the right place of *understanding*."

8. These sweeping generalisations are based on a detailed presentation in *Historisches Wörterbuch der Philosophie*, to which I refer anyone wishing to learn more about the history of the term.

9. Quoted from Molander (2015, 78), translated by Frank Perry.

10. In philosophy of science, the first variant is often called *instrumentalism* or *anti-realism* and the second, object-oriented variant (scientific) *realism*.

11. Researchers in 'the arts' are 'scholars'.

12. Of course, this does not mean that, by assimilating practice-oriented theory, one will also master the practice concerned.

13. The focus may be on objects (ontological) or methods (methodological).

14. This meaning of theory overlaps partially, and, not surprisingly, with Thomas Kuhn's (1970) concept of paradigm (as a disciplinary matrix).

15. Information on historicism is available in Schnädelbach (1984).

16. This may also be expressed as "seeing something *as* something."

17. Cf. Schön's term "naming and framing" (Schön 1983, 40, and in other places).

18. Part of this has been thematised within the framework of the term *paradigm*, which I will not go into in further detail here.

19. *Rhetoric* means eloquence or the art of persuasion. Here I am focusing on the external, social side of this.

20. Cf. Kahnemann (2011), who refers repeatedly to "theory-induced blindness."

21. This refers to a Swedish book, *Räkna rätt och tänka fritt* (1987), in which I distinguish between three aspects of a science or a field of scholarly study: 'The idea of science,' which means a common, open, and critical search for truth; 'methodologically defined research practice'; and 'the arts and sciences as social institutions.'

22. He refers to Michael Polanyi's term "tacit knowing."

23. Unpublished draft, 13 August 2012.

24. Cf. Polanyi's term "maxim," a rule that only those that are already skilled can follow (Polanyi 1978, 30–31). Cf. also Winch (2010) about "knowing how something is done" being one thing and skilled execution another.

25. I have had access to material from: Roald Renmælmo (on bearers of tradition, their craftsmanship, and their tools), Nina Nilsson (on colour composition and shaping of parks and gardens), Tina Westerlund (propagation of perennials; plant knowledge; and plant composition), Ulrik Hjort Lassen (post construction), and Tomas Karlsson (planing bench joinery; door production).

26. Renmælmo talks about studying tools and craft objects "by making copies."

27. Cf. what Gunnar Almevik (quotation above) calls "high universal level."

APPENDIX

Taken from the Oxford English Dictionary, 2nd edition, 1989. Online version June 2012. Accessed 13 August 2012. http://www.oed.com/view/Entry/200431.

I have excluded meanings which are no longer used, which are marked as rare, or which have a special mathematical meaning.

theory, n.[1]

Etymology: < late Latin *theōria* (Jerome in Ezech. xii. xl. 4), < Greek θεωρία a looking at, viewing, contemplation, speculation, theory, also a sight, a spectacle, abstr. n. < *θεωρός* (< **θεαορός*) spectator, looker on, < stem *θεα-* of *θεᾶσθαι* to look on, view, contemplate. In mod. use probably < medieval Latin translation of Aristotle. […]

[…]

3. A conception or mental scheme of something to be done, or of the method of doing it; a systematic statement of rules or principles to be followed.

4. a. A scheme or system of ideas or statements held as an explanation or account of a group of facts or phenomena; a hypothesis that has been confirmed or established by observation or experiment, and is propounded or accepted as accounting for the known facts; a statement of what are held to be the general laws, principles, or causes of something known or observed.

b. That department of an art or technical subject which consists in the knowledge or statement of the facts on which it depends, or of its principles or methods, as distinguished from the *practice* of it.

[…]

5. In the abstract (without definite article): Systematic conception or statement of the principles of something; abstract knowledge, or the formulation of it: often used as implying more or less unsupported hypothesis (cf. 6): distinguished from or opposed to *practice* (cf. 4b). in theory (formerly in the theory): according to theory, theoretically (opp. to *in practice* or *in fact*).

6. In a loose or general sense: A hypothesis proposed as an explanation; hence, a mere hypothesis, speculation, conjecture; an idea or set of ideas about something; an individual view or notion. Cf. 4.

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