Andreas Fickers,
Annie van den Oever

DOING
EXPERIMENTAL
MEDIA
ARCHAEOLOGY

THEORY

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Doing Experimental Media Archaeology

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This book is the twin volume to *Doing Experimental Media Archaeology: Practice* (ISBN 978-3-11-079581-3), authored by Tim van der Heijden and Aleksander Kolkowski, volume 2 in this paired set. For ease of cross-referencing, in-text references will be used, preceded by ▶ Practice.

Acknowledgements

When we started this project in 2013, we did so from a background of experience with collections of media devices. Both of us had worked in technology museums and film and media archives respectively. Andreas worked in the Deutsches Museum in Munich and Bonn with a long-standing tradition of tinkering with technical devices. He is the founder and Director of the Centre for Contemporary and Digital History at Luxembourg University and the initiator of the project "Doing Experimental Media Archaeology (DEMA): Practice & Theory". Annie is the founding director of the Film Archive & Media Archaeology Lab at the University of Groningen, which has a long history of hands-on experiments developed for educational purposes.

In 2013, we devoted a symposium to the question *how to turn an archive into a research laboratory*, a question which was discussed in the symposium "The Film Archive as a Research Laboratory", organized by the Film Archive embedded in the University of Groningen in close collaboration with Giovanna Fossati as Head Curator of the Eye Filmmuseum the Netherlands. Among the other participants were Ian Christie, coming from the British Film Institute; Roger Odin, the former Head of research group IRCAV at Paris 3, Sorbonne Nouvelle, and a home movie expert with archival knowledge of the field; Heide Schlüpmann, the founder, with Karola Gramann, of the Kinothek Asta Nielsen at Frankfurt's Goethe University; Eric de Kuyper, the former director, with Hoos Blotkamp, of the Film Museum in the Netherlands (the predecessor of EYE); Jan Holmberg, the head curator and CEO of the Ingmar Bergman Foundation in Stockholm; Harry Romijn, the general-director of the Groningen Regional Film Archive, GAVA; the Eye team, with curator of the apparatus collection, Soeluh van den Berg; and expert technician and educationalist Hans van der Kraan; and Eef Masson, with Giovanna Fossati a driving force behind the Master program Preservation and Presentation of the Moving Image at the University of Amsterdam; Sabine Lenk, television and film archivist and the former director of the Filmmuseum Düsseldorf; Frank Kessler, early cinema scholar from Utrecht University and the chair of the international society for the study of early cinema Domitor at the time; Emile Poppe, area manager *Grafik* at Cinematek Brussels at the time; Tjitte de Vries and Ati Mul as the two main donators of the film reels and apparatuses in the film archive; and the members of the NWO-funded home movie research team, including Andreas Fickers, Susan Aasman, Jo Wachelder, Tim van der Heijden, and Tom Slootweg.

We would like to warmly thank all of these colleagues so deeply invested in rethinking archival / apparatus collections of archival collections for education and research The Film Archive's team embedded in the University of Groningen, the home movie team, and the research group at the University of Luxembourg

have been naturally drawn to each other due to a shared ambition with regard to what to do with the apparatuses put at their disposal for research and teaching. We want to specifically thank Susan Aasman, Jo Wachelder, Tim van der Heijden, and Tom Slootweg, for the fruitful discussions that were held on the type of experimental media archaeology in the context of the research project "Changing Platforms of Ritualised Memory Practices: The Cultural Dynamics of Home Movies", funded by the Netherlands Organisation for Scientific Research (NWO), and lead by Susan and Andreas. From the University of Groningen, we also like to thank the film archive's trustees, Eva de Jong, Jaukje van Wonderen, Bernd Warnders, and the late Johan Stadtman; André Rosendaal as the project manager of the pilot project on "Curating Media Heritage", which was executed with Bernd Warnders; and the film archive's trainees, Shant Bayramian, Nina Yakimova, Nynke Bruinsma; and research trainee Julia Munuera Garcia.

Many colleagues had been working with precious and rare historical objects in archives and museum collections, yet only some were working with highly eclectic collections of media devices which mostly were neither old, nor rare, nor precious. In retrospect, the emergence of such collections seems symptomatic for the innovations in the field. Rather new at the time was the keen interest in such university-embedded collections as they allowed hands-on experimentation with devices for research and educational purposes in ways museum collections – with fragile, precious objects – can hardly afford to initiate. What we took from these discussions is the crucial role a close collaboration between media scholars, archivists and curators can play in research. In joint as well as in separate papers, panels and publications, we have focused on media as material objects and the sensorial dimensions playing out in media use and on media experiences to be included in the histories of media and technology ever since.

Particularly relevant has been the thinking through of the potential of such collections and archive-driven research for innovations in the field of education and research in the field of film and media. The results of these reflections have been published in "Experimental Media Archaeology: A Plea for New Directions", which we published in *Technē/Technology: Researching Cinema and Media Technologies – Their Development, Use, and Impact* in 2014. Expanded and amended versions of this plea were written by Andreas in 2015 in "Hands-on! Plädoyer für eine experimentelle Medienarchäologie," in Technikgeschichte Vol. 82 and 2018 in "How to grasp historical media dispositifs in practice?" in the volume *Materializing Memory Practices*, edited by Susan Aasman, Andreas Fickers and Jo Wachelder. And Annie expanded on the plea with further reflections on archival practices and hands-on experiments with devices in the film archive in her book with Giovanna Fossati, *Exposing the Film Apparatus. The Film Archive as a Research Lab*, published in 2016.

Thinking about "New Directions" in the plea formed the start of our proposition to reframe the basic value for media history and media heritage studies of such collections of apparatuses in archives and museums. It also formed the starting point of the ongoing dialogue between the two of us. Over the years, it has resulted in a further series of joint paper presentations – at the media archaeology conference at the University of Bradford and in the Media Museum in Bradford, hosted by Mark Goodall and Ben Roberts; at the "Hands on Media History" conference in London, hosted by John Ellis and Nick Hall at Royal Holloway University of London; and in a successive workshop in the Science Museum, hosted by Tim Boon as Head of Research. These papers have resulted in publications in *New Media Archaeologies*, edited by Ben Roberts and Mark Goodall; and in *Hands On Media History. A New Methodology in the Humanities and Social Sciences*, edited by Nick Hall and John Ellis, respectively. We are very grateful to these book editors as well as to Routledge and Amsterdam University Press for their permission to republish our chapters, in a reworked version, in this book.

By now, we feel we are part of a growing international network of colleagues and partners who wish to contribute to revitalising the ambition of using the archive as a laboratory, allowing all of us to take research into new directions. We thank our colleagues invested in this field for sharing their thoughts on a multitude of projects with us at a number of occasions: Lori Emerson, founding director of the Media Archaeology Lab at Boulder University, and writer of *The Lab Book: Situated Practices in Media Studies*, co-written with Jussi Parikka, media archaeologist and new media theorist; with Jussi and Wolfgang Ernst, hosting the exquisite Media Archaeological Fundus at the Humboldt University in Berlin, where we had the pleasure to discuss media archaeological labs on several occasions, among them the symposium "Cultural Technology Research Collaboratorium – CTrC", at the Department of Communication and Design at Bilkent University, Ankara, and hosted by Andreas Treske and Ahmet Gürata. We also thank Wanda Strauven and Alexandra Schneider – both of whom have been recording and analysing media practices created by young children – for their insights and for drawing attention to the hands-on experiments in education in this field as inspired by the Italian futurists.

We are also very grateful for the dialogue with Patrick Ellis and Colin Williamson as the editors of this special issue of *Early Popular Visual Culture* devoted to experimental media archaeology and to the history and future of experimentation with film and media devices in education. We also owe a debt of thanks to Tom Gunning's early and lucid reflections as an early cinema historian on wonder and cycles of wonder and on treating old technologies as *once new*; this includes our gratefulness for a recent dialogue with him on the effects of

We want to pay tribute to Elizabeth Rankin, who not only copy edited our manuscript, but also made us profit in surprising and interesting ways from her expertise as an emeritus Professor of Art History. We extend our gratitude to the late Johan Stadtman, to Klaas Lommerse, and to Julia Munuera Garcia for taking photographs of some experiments and providing illustrations for our book. We are also grateful to Tamari (Tako) Tsetsadze for preparing the references and the bibliography.

Finally, we extend our sincere gratitude to Rabea Rittgerodt at De Gruyter Publishers for being so supportive and flexible in the preparations of the publication of this book.

On the book cover, as in the articles we have written and published together, our names are presented in a simple alphabetical order because we never felt like establishing a 'first / second author' hierarchy between the two of us as our fields of expertise so happily overlap as well as constructively complement each other.

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Andreas Fickers and Annie van den Oever

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Contents

Introduction

Cabinets of Wonder

In her book *Vesper Flights* (2020), the English writer and historian of science Helen MacDonald reminds her readers that the literal translation of *Wunderkammer* is *cabinet of wonders*, a term which best captures the purpose of these collections.[1]

> It was expected that people should pick up and *handle* the objects in these cases; feel their textures, their weights, their particular strangenesses. *Nothing was kept behind glass, as in a modern museum or gallery* (our italics).[2]

The cabinet of wonders was set up in a sensory way, that is to say, by speaking to all the senses and not by surprising only the eye. As MacDonald reiterates, the objects were not so much put on show, to be seen, but rather they were meant *to be handled*. Many objects found in the *Wunderkammer* are more or less the size of a hand and they are meant to be held – fossils, miniature paintings, pieces of coral, insects, rocks and feathers.[3] The hand played a crucial role in the sensorial surprises intended by the *Wunderkammer*'s display. The main attraction of this way of collecting and exhibiting "curiosities" – *Cabinet of Curiosities* is the most commonly used term in English – was indeed their ability to create an intense sense of wonder.

MacDonald's description stands out to us as an important reminder of how historical objects were arranged and exhibited in a certain way to provide physical contact with worlds unknown, or forgotten. Each of the sensorial experiences to be had while handling these objects and artefacts may have been memorable in its own right, and the sensorial qualities of the objects were striking by contrast: soft and almost weightless (the feathers), sharp round the edges (coral), bafflingly small (miniature paintings), tiny and fragile (the insects), colourful. The collections were purposefully diverse and these notable differences in form, size, weight, texture, and colour were thus part of the appeal; the odd and striking combinations of objects were meant to enhance the surprise. According to Gaston Bachelard, the *Wunderkammer* offered a special space for a meeting with the rare, the exotic and

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1 Helen MacDonald, *Vesper Flights. New and Collected Essays* (London: Jonathan Cape, 2020), vii.

2 MacDonald, *Vesper Flights,* vii.

3 MacDonald, *Vesper Flights,* vii.

the esoteric.[4] In MacDonald's words, the pleasure of handling these objects is driven by their "strangeness".[5] All these artefacts are prone to trigger something like an art experience, a (senso-)perceptual experience, which is deepened and prolonged by the strange "newness" of these objects to the senses. Therefore, according to modern art theory,[6] they will have a notable impact on perception, the way familiar objects (chairs, trees) do when artists have made them (look, sound or feel) strange. These hybrid collections of *Wunderkammer* artefacts share several elements with art objects: curatorial complexity; material features inducing distinctive sensorial responses; and objects somehow being "strange" or "new" to the senses. These collections of objects, as well as the ways in which they have been assembled and exhibited, have attracted attention from art historians such as Barbara Maria Stafford.[7]

The *Wunderkammer* setup has indeed had a considerable impact on art studies and has served as a model to some, Aby Warburg among them.[8] Art historians have been fascinated by these collections and have studied artefacts as objects with distinct material features and a notable and pivotal senso-perceptual and experiential potential.[9] Compared to this, the impact of the *Wunderkammer* setup on the sciences is relatively modest.[10] With few exceptions – mainly in the field

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4 See the third chapter of Gaston Bachelard, *Poetics of Space* (Boston: Beacon Press, 1969), 74–89. See also Gaston Bachelard, *La Poétique de la Rêverie* (Paris: Press Universitaires de France, 1965).

5 MacDonald, *Vesper Flights,* vii–viii.

6 See Victor Shklovsky, "Art as Technique," in *Russian Formalist Criticism: Four Essays*, ed. Lee T. Lemon and Marion J. Reis (Lincoln: University of Nebraska Press, 1965), 3–24. See also Annie van den Oever, ed., *Ostrannenie* (Amsterdam University Press, 2010) for the relevance of this theory to film and media studies today.

7 See Barbara Stafford, *Artful Science: Enlightenment, Entertainment and the Eclipse of Visual Education* (Cambridge, MA: MIT Press, 1994), which places all sorts of *Wunderkammer* artefacts within a context of Enlightenment attitudes toward both education and vision. See Tom Gunning's comment on her approach in his article on the thaumatrope (Gunning, "Hand and Eye: Excavating a New Technology of the Image in the Victorian Era," Special Issue: Papers and Responses from the Ninth Annual Conference of the North American Victorian Studies Association, *Victorian Studies* 54, no. 3 [2012]: 495–516).

8 Note that the *Wunderkammer*, in constant evolution, forms the model for Aby Warburg's study of art as presented in his *Bilderatlas Mnemosyne* (Hatje Cantz Verlag, 2020), https://warburg.sas.ac.uk/library-collections/warburg-institute-archive/online-bilderatlas-mnemosyne [last accessed 26.07.2022].

9 See Victor Shklovsky, "Art as Technique." Shklovsky was the founder of a modern theory of art that drew on perception studies and created a new focus on art from the perspective of the art *experience*.

10 An insightful study of the attractions of wonder and the *Wunderkammer* to the sciences over time was written in the 1990s by historian of science Katharine Park and Lorraine Daston,

of media archaeology[11] – the same can be said of media studies. Most media theories have framed their object of study in entirely different epistemological realms.[12]

Now the question is: *Does the Wunderkammer setup provide an interesting model for thinking about media to us, media scholars, today?*[13] A relatively short and simple answer would be that many media, no less than the natural history artefacts described by MacDonald, have a senso-perceptual potential that expresses itself even before they are handled. For instance, radio sets of the 1930s were designed as auratic objects of wonder, where the integrated loudspeaker turned into the mouth of an apparatus speaking to the listener, complemented by a "magic eye" as fine-tuning aid. As icons of a virtual ether voyage, the illuminated radio dials triggered the imagination of radio listeners. The whole set

director of the Max Planck Institute for the History of Science in Berlin at the time. (Park and Daston, *Wonders and the Order of Nature, 1150–1750* [New York / New Jersey: Zone Books, 1998]). They have argued that, in the sciences, a keen interest in the *Wunderkammer*, and in the aberrant and quirky nature of the objects they collected, gave way in the post-Enlightenment era "to a focus on more regular specimens illustrating nature's uniform laws".

11 For instance, see Siegfried Zielinski, *Deep Time of the Media. Toward an Archaeology of Hearing and Seeing by Technical Means*, trans. Gloria Custance (Cambridge, MA: MIT Press, 2006); originally published as *Archäologie der Medien: Zur Tiefenzeit des Technischen Hörens und Sehens* (Reinbek bei Hamburg: Rowohlt Taschenbuch Verlag, 2002). Another example is Erkki Huhtamo's series of studies inspired by work on his private collection of historical devices, which is organized more or less as a Cabinet of Wonders. See also what Simone Natale honours as Huhtamo's "antiquarian approach to media history"; his "antiquarian vocation, by which media are studied also and especially in their materiality and technical functionality"; and the reader being guided "in a personal museum where the gaze of the media and cultural historian fuses with the skills of the antiquarian and the archaeologist". Simon Natale, "The Historian and the Antiquarian: Erkki Huhtamo's Media Archaeology," *Cinémas* 25, nos. 2–3 (2019):188–189.

12 See Lambert Wiesing's critique as a phenomenologist on the main media theory's poor definition of the object of studies, and on the ways in which many theorists have overlooked the material, technological, experiential and other aspects in their studies of media; (in English translation) Wiesing, "What are Media?" in *Technē/Technology*, ed. Annie van den Oever (Amsterdam University Press, 2014), 93–104.

13 When we use the term *media scholars* here, we do not mean this in a strict institutional sense of colleagues working in a media department, but rather for all scholars studying any or all the media – be it film, TV, radio, new media, social media or gaming – from any perspective. We acknowledge that media studies more generally, and media archaeology in particular, are *transdisciplinary* in so far as they refuse media-specific distinctions between the histories and archaeology of film, radio, television; and *transmedial* in their study of genealogies across media practices.

embodied a sublime promise of mediated participation to the world.[14] In a similar fashion, television sets with their wooden cabinets made in the 1950s were pieces of furniture, designed to be seen, touched, felt, and valued, just like a *Wunderkammer* object. Studying the sensorial properties of such a device adds a pivotal dimension to the study of these objects *in use*, a perceptual, sensorial and experiential dimension, which we assume has a particular relevance for the study of media.[15] Based on our experiences with media, we assume that studying the senso-perceptual dimensions of a device – for instance, the IPhone with its appealing, smooth, fingerprint-resistant oleophobic coating, which brings the user notable haptic pleasures and anticipates the sustained touching and manipulation needed for the proper use of the phone – does help to understand "media experiences", in the same way we understand so-called "art experiences" as deepened and prolonged perceptual experiences (according to modern art theory).[16] In addition, we assume that such "media experiences" shape the practices of use of these media and affect the processes of their appropriation – the adoption and acceptance of media by users. In other words, we assume that media experiences have had an impact on media practices deeply enough to need reflection in media history. This does raise the question of why the material and sensorial dimensions of media objects have attracted relatively little attention in media historiography thus far.

A much longer and more complex answer to the same question – a more sophisticated one, if you will – would need to entail a much broader reflection on the field of media studies and the construction of its object of studies, its epistemic object, in different phases of its development. It would need to take on board the argument that the major technological revolutions have had an impact on contemporary theories of technology and media, hence on the different ways in

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14 Andreas Fickers, "Design als 'mediating interface'. Zur Zeugen- und Zeichenhaftigkeit des Radioapparats," in *Berichte zur Wissenschaftsgeschichte*, 30, no. 3 (2007): 199–213; Andreas Fickers, "Visibly audible. The Radio Dial as Mediating Interface," in *The Oxford Handbook of Sound Studies*, ed. Trevor Pinch and Karin Bijsterveld (Oxford: Oxford University Press, 2012), 411–439.
15 Note that we distinguish the material properties of an object from its performative qualities and that we suggest, as we discuss in Chapter 1, that the apparatus in a strictly *material* sense – *l'appareil de base* in the French sense of the word – is used for re-enactment, e.g., to tease out its performative qualities. Following Fossati, we distinguish the apparatus (as a material rather than a conceptual thing) from the artefact (as a conceptual rather than a material thing); see the first and last chapters of Giovanna Fossati, *From Grain to Pixel* (Amsterdam: Amsterdam University Press, 2018).
16 See Victor Shklovsky, "Art as Technique," 3–24.

which their object of study has been constructed during this last century.[17] To give just one example of the changes in terminology: the word "media" in mass media studies in the 1970s was used for the news media, of which paper-printed newspapers have been the emblem and model for so long. This model initially even dictated the way in which the new (news)medium of the 1960s, television, was studied in so-called "mass media studies". The primal model for the study of the communication and information media being *language* almost automatically implied that the "machinery" involved in the mediating processes was over-looked at the time.[18] By implication, "medium", "technique"/ "technology", and "art" were indeed framed (by media, technology and art history respectively) in entirely different epistemological realms. Unsurprisingly, then, technology and science museums, art museums and film and media archives have had very different attitudes and approaches to their collections of objects, and in particular towards the apparatuses in their collections.[19]

New approaches were brought about by the so-called "digital revolution".[20] It affected the way in which "art", "technique", "technology", "film", and "media"

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17 Film and technology expert Benoît Turquety presents an *archaeology* of the changing relations between cinema and technology, first, as emerging in the early decades of the twentieth century following the "birth" of the cinema; and second, as emerging in the digital era. He discusses the impact of these changes on the meanings of the terms *technology*, *technique*, *machine*, and reminds his readers that in the French-speaking area "*techniques* are both the machines and the ways those machines are used", whereas *technology* refers to the knowledge or "the logos about techniques", though he acknowledges at the same time that this "sounds now obsolete in English – as well as in common French uses". He adds though that, in the French-speaking scientific tradition, *technology*, up to this day, "designates the discourses about techniques, whether scientific or prescriptive, discourses which can be studied as a cultural object in themselves" (Turquety, "Toward an Archaeology of the Cinema / Technology Relation: From Mechanization to 'Digital Cinema'," in *Technē /Technology*, ed. Annie van den Oever [Amsterdam: Amsterdam University Press, 2014], 52–53). We will return to reflections on the terminology throughout this book.
18 On the assumed "transparency" of media, see Lambert Wiesing, "What are Media?". Some changes in this field are discussed in Chapters 1 and 3, i.e., the impact of modern media theory by Marshall McLuhan and, more importantly, the notion of "technical media" coined by Friedrich Kittler as part of his media archaeology.
19 For a more elaborate reflection on this topic, see the "Introduction" by Giovanna Fossati and Annie van den Oever, from which we are drawing here, in *Exposing the Film Apparatus*: *The Film Archive as a Research Lab*, eds. Giovanna Fossati and Annie van den Oever (Amsterdam: Amsterdam University Press, 2016), 13–43.
20 André Gaudreault wrote about how the digital turn had fuelled "many debates, which have logically led to the return of film technology as an integral element of film theory, film aesthetics, archiving and restoration, and discourse about film industry and film epistemology". He also stressed that technology "had once been at the margins of film studies, a distinct, circumscribed

were framed. The meaning of these basic notions changed considerably in the digital era, to such a degree that the word "media" no longer referred to just newspapers but rather to digital media in new media studies. New terms such as "media art", "digital technologies", and "digital film" entered the scene. Relevant to the field of media studies too was the so-called "historical turn" initiated by early cinema scholars, whose ability to infuse their archive-driven (film) historical projects with historiographical and theoretical questions has been very productive and influential.[21] As a result, inevitably, the study of media and more specifically the archive-driven research on so-called "pre" and "early cinema" devices changed too.[22] The so-called "material turn"[23] has been discussed by some as a "renewed longing for the experience of the materiality of the medium" and as "a *counter effect* to large-scale digitization".[24] If anything, the material turn draws attention to the haptic interaction with the material "as opposed to the experience

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area of film history for aficionados, collectors and some notable researchers (such as Barry Salt, Paul Spehr and Deac Rossell, for example), *has become a central hub of theoretical questioning*". (italics added). (Gaudreault, "Foreword," in *Technology and Film Scholarship Experience, Study, Theory*, ed. Santiago Hidalgo, [Amsterdam: Amsterdam University Press, 2018], 9–12. Series Technology and Film Scholarship.)

21 In the late 1970s, a new generation of historians, dissatisfied "with the surveys and overviews, the tales of pioneers and adventurers that for too long passed as film histories" emerged and reenergized the study of early cinema, as Thomas Elsaesser wrote in "The New Film History," *Sight & Sound* 55, no. 4 (Fall 1986): 246. These developments bloomed in the 1990s in what was now often called "early cinema studies". Media archaeology as a new and emerging field in the humanities was technology-centred from early on. These two fields helped create a new focus on the materiality of the medium as well as the relevance of the archive for research, e.g., of the medium of film in its early days. For a further discussion of these changes in film scholarship, see André Gaudreault and Tom Gunning, "Early Cinema as a Challenge to Film History," reprinted in *The Cinema of Attractions Reloaded*, ed. Wanda Strauven (Amsterdam: Amsterdam University Press, 2006), 365–380. Technologies had received relatively little attention from historians, with a few exceptions, e.g., C. W. Ceram, *Archaeology of Cinema*, trans. Richard Winston (London: Thames & Hudson, 1965). Remarkable also was Barry Salt's attempt to draw attention to film technologies in his 1983 *Film Style and Technology: History and Analysis* (London: Starword, 2009).

22 "These new approaches challenge the film-centred approach, which has been adopted by film archives since the 1930s." See Fossati and Van den Oever, eds., *Exposing the Film Apparatus*, 27.

23 This term is more broadly used in the fields of history, art and media studies, and archival studies. Cf. Elisabeth Edwards and J. Hart, eds., "Introduction: Photographs as Object," in *Photographs, Objects, Histories: On the Materiality of Images* (London: Routledge, 2004), 3. For the impact of the "material turn" on archival practices, see also *Exposing the Film Apparatus*, 27–28.

24 Fossati and Van den Oever, eds., *Exposing the Film Apparatus*, 27.

of the virtual immateriality of digital access".[25] The shift in focus has been interpreted by some as a nostalgia for the here-and-now of the physical, a longing for an experience of the material amidst the elusive world of the digital and the "online".[26] It seems to us though that the smartphone has affected our relation to media technologies in major ways and that today's public has had a closer, more intimate and also much more physical relationship with technological devices since its emergence. Almost overnight, it seems to have become the emblematic "new medium" of the twenty-first century. Being designed to be worn on the body, light and smooth and mobile and exactly the size of the hand, it is a recording and display device for sound and images, still and moving, and, moreover, an archiving and storing device, a dissemination and communication device, and all this at once. We must ask ourselves whether this device did not silently, overnight, become the new model for thinking about both media and technology at the same time.[27]

Wunderkammer-Like Collections of Media Devices

From a curatorial point of view, curators and archivists have responded to shifts in the experience and interest of the public and have adapted their collecting and exhibition strategies.[28] There is a clear interest in "technical media",[29] such as film projectors, typewriters and other apparatuses being studied within media studies programs, and with film and media museums exhibiting their collections in new forms.[30] In the archival world, apparatus collections have become more

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25 Fossati and Van den Oever, eds., *Exposing the Film Apparatus*, 28.

26 See Svetlana Boym, *The Future of Nostalgia* (New York: Basic Books, 2001).

27 For profound reflections on the smartphone as a new and revolutionary device, see Roger Odin's chapter "Cinema in my Pocket," in *Exposing the Film Apparatus*, eds. Fossati and Van den Oever, 45–54, with further references to key publications in this field.

28 Giovanna Fossati has drawn attention to the fact that collections are more often than not driven by the personal interests and concerns of curators and that they are the driving forces for the acquisition of a device or a collection. "Apparatus collections have rarely been determined by a canon, nor have they been strictly driven by explicit policies." For a range of examples and a further explanation of the strategy, see also Fossati and Van den Oever, eds., "Introduction," in *Exposing the Film Apparatus*, 13–43, and the examples provided by 29 authors in each of the successive 29 chapters.

29 *Technical media* is a term coined by Friedrich Kittler in his book *Gramophone, Film, Typewriter*, trans. Geoffrey Winthrop-Young and Michael Wutz. (Stanford, CA: Stanford University Press,1999); see also Chapters 1 and 3.

30 See Santiago Hidalgo, "Introduction. The Discursive Spaces Between a History of Film," *Technology and Film Scholarship Experience*, ed. S. Hidalgo, 9–12.

prominent and the work on them more palpable.[31] As the word "palpable" suggests, the material, the haptic, and the sensorial turns have been moving objects centre stage, at least in some of the new exhibition practices in science and film museums.[32] New exhibition setups create a new focus on apparatus collections, making media curators keenly aware that today's new media are tomorrow's waste, and that the new collection strategies need to take them on board so as not to lose all the seemingly worthless toys and mass-made game devices, popular one day, obsolete the next.[33] The curatorial shift from collecting the precious and rare to assembling mass-produced, omnipresent and invaluable objects has been relevant to us. The *Wunderkammer* setup provides in itself a useful reminder that all could have been lost in the blink of an eye – a pebble with a drawing on it and so many other testimonies of half-forgotten eras. As opposed to the rare objects in museum collections, many of the media devices that came our way, and which have been assembled in our media collections over the years, allow and even invite or demand hands-on manipulation the same way many of the seventeenth- to nineteenth-century historical devices and toys do. An example is the thaumatrope, an optical toy discussed by Tom Gunning as a typically nineteenth-century "philosophical toy", which, he argued, was designed and used for educational and entertainment purposes.[34]

As we can confirm from our own experience, such devices of wonder are particularly interesting for use in an educational context. The thaumatrope is in fact a device made and meant for use in an educational or entertainment context, and it indeed makes for a gratifying choice; not only because it is so easy to manipulate, but also because it instantly and unfailingly creates a *wow effect*, as well as an exemplary senso-perceptual experience – which is interesting to reflect upon in an educational context. As with so many of these optical devices from this era, the thaumatrope is intended for hands-on use, only giving

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31 Fossati and Van den Oever, eds., *Exposing the Film Apparatus*, 27–28. See also Alberto Beltrame, Giuseppe Fidotta, and Andrea Mariani, eds., *At the Borders of (Film) History: Temporality, Archaeology, Theories* (Udine: Forum, 2015).
32 See for instance the (research on) collection and exhibition policies and strategies undertaken by the Science Museum Group in London, which includes the Media Museum in Bradford, https://www.sciencemuseumgroup.org.uk/our-work/research-public-history [last accessed 26.07.2022].
33 This was made explicit during the Media Archaeology conference in Bradford hosted by Mark Goodall and Ben Roberts in 2014. Particularly relevant were the reflections on new collection strategies by curator Tony Scott, and her work on the apparatus collections assembled in the Media Museum in Bradford, which is part of the Science Museum Group. See B. Roberts and M. Goodall, *New Media Archaeologies* (Amsterdam: Amsterdam University Press, 2019).
34 See Gunning, "Hand and Eye," 500–501.

Fig. 1: Student tinkering with a Thaumatrope. Photograph by Julia Munuera Garcia. Courtesy of the Film Archive and Media Archaeology Laboratory of the University of Groningen.

away its secrets when properly operated. In Gunning's words, the "composite image produced by the thaumatrope is perceived only when the device is properly in motion. Once the device ceases to operate, we experience the rupture between the previous perception and the now-inert device; instead of a fused image, the bird and cage now separate into independent images".[35] As he argues, these "devices manipulate (many sources would describe it as fooling or tricking) human perception into seeing an image, thus creating visual experiences dependent on operating the devices".[36] Therefore, he famously labelled such images "technological images", evoking a contrast between the simplicity of the device itself and the "unique phenomenological quality" of the experience.[37] In our experience, such technically simple "devices of wonder" are very

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[35] Gunning, "Hand and Eye," 500–501.

[36] Gunning, "Hand and Eye," 500–501.

[37] Gunning refers to Jonathan Crary, who also proved to be impressed by "the fabricated and the hallucinatory nature of its [the thaumatrope's] image and the rupture between perception and its object". ("Hand and Eye," 500–501).

well suited for use in an educational setting, as they easily pull in the viewer by creating a sense of wonder, and they unfailingly trigger a set of questions and philosophical reflections on the unique phenomenological quality of technical images and the viewing experiences they create.

It is a prerogative of collections such as the ones we use in research and teaching that they allow for a *Wunderkammer*-like invitation to see, feel, touch, and handle the objects, many of which are themselves made to stir a useful sense of wonder in students and researchers alike. Since we have been working with these collections of media technologies, we have been thinking about the *Wunder-kammer* and how this setup is so much more appropriate for our collections of historical media devices than, say, the classical "white box" form of modern art museums. The *Wunderkammer* setup comes with the pleasures of wonder and excitement and a drive to touch and to "handle" (MacDonald) the objects and to speak about them, if only after the silence and joy of the first moment of excitement perhaps. And it is often followed by a wish to share first impressions and observations, and an attempt to articulate experiences in dialogue with students and colleagues in the field. This practice of "re-doing" is of pivotal value for our project because it inspires and deepens the reflections on media, their sensorial and senso-perceptual qualities, and their impact on experience, among them phenomena that beg further exploration, such as the technological uncanny[38] as opposed to the technological sublime.[39] These technological images are opposed to images that are painted and need no manipulation by viewers to be seen.

Such reflections form the background for the thinking laid out in this book. They have helped us to think through media, questioning their materiality, senso-perceptual and performative properties, the use of our senses in media research, and the way we deal with historical objects as historical sources. What is the relevance of probing historical devices for media historians? What are the affordances for teaching? What can we learn from the inevitable technical failures? What are the affordances of teamwork in a "lab" context? The way to address these questions has been foremost throughout: to think while handling these objects; to address the questions which emerge from or during (everyday) media

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[38] See Laura Mulvey, *Death 24x a Second. Stillness and the Moving Image* (London: Reaktion Books, 2006). See also Tom Gunning, "Re-Newing Old Technologies: Astonishment, Second Nature, and the Uncanny in Technology from the Previous Turn-of-the-Century," in D. Thorburn and H. Jenkins, *Rethinking Media Change: The Aesthetics of Transition* (Cambridge, MA: MIT Press), 39–59.

[39] See David Nye, *Technology Matters. Questions to Live With* (Cambridge, MA: MIT Press, 2007).

Fig. 2: Editing table and apparatuses as setup in the Film Archive. Photograph by Johan Stadtman. Courtesy of the Film Archive and Media Archaeology Laboratory of the University of Groningen.

use in research and teaching. Media archaeologist Erkki Huhtamo has introduced the term *thinkering* for this method of "thinking while doing".[40]

The Genesis of this Book

Since 2013, when we started to rethink research on media from the standpoint of hands-on access to media collections, our thinking about media devices and media history has primarily been driven by hands-on access to our eclectic collections of media devices. Most of the theorizing that is synthesized in this book evolved from this hands-on experimentation,[41] which was thus not done

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40 Erkki Huhtamo, "Thinkering with Media: On the Art of Paul DeMarinis," in *Buried in Noise*, ed. P. DeMarinis (Heidelberg: Kehrer, 2011), 33–39.
41 Throughout this book, we use the terms re-enactment, re-using, re-making, re-doing, experiment and experimentation as synonyms, though there are differences in their connotations and their historical practices of use.

as an *a priori,* but *on the go*, as it were. This book reflects, chapter by chapter, our theoretical, historiographical and epistemological rethinking of a media history based on certain concepts and assumptions that are so deeply embedded in our fields of studies, that they could do with a bit of probing so as to be made more visible.[42] We have done so in dialogue, with our teams and with each other, and with colleagues in the field.[43]

This book contains many traces of the "shared thinking" (and writing) done with Giovanna Fossati – centred around the questions of *why* and *how* to turn archives into research labs – and inevitably we have been drawing from *Exposing the Film Apparatus* (2016) she wrote with Annie van den Oever at several points. Chapter 1, furthermore, reflects her input as a peer critic. Chapter 2 mirrors elements of dialogue with Ben Roberts and Mark Goodall, following the Media Archaeology conference hosted by them at the University of Bradford, and in the Media Museum in Bradford. In a similar manner, Chapter 3 mirrors elements of dialogue with John Ellis and Nick Hall, from Royal Holloway University of London, following the Hands-On History conference hosted by them in London; as well as the embedded Experimental Media Archaeology workshop, hosted by Tim

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42 One recent source of inspiration that we would like to mention in this respect is Benoît Turquety's small but exquisite 2019 study "Medium, Format, Configuration: The Displacement of Film," in *Configurations of Film Series* (Lüneburg: Meson Press), 17–54. This publication is driven by case studies which help Turquety to probe, once again, some of the key terms used in our field – "media", "format", "media configuration" – and he does so from a media-ethnographical perspective, to illuminate the deficiencies in the methods and terminology used.

43 As may have become clear in these last sections, we are part of and identify with the reflections on the developments in the field of media archaeology in the last decade as described by Erkki Huhtamo and Doron Galili in the introduction to their special issue on media archaeology, published in *Early Popular Visual Culture* only recently. They speak of a maturing of the field of media archaeology which "has also extended its scope and depth of interactions with other scholarly pursuits". They pay attention to the "new thematic and methodological variants of media archaeologies" proposed by scholars in the last decade; and they see the branching of it in several directions, while marking "four commonly shared attributes", the second being an "involvement with non-discursive aspects of media, which refers to the shift away from textual analyses of media contents to investigations of the material, technical, and operational properties of media and analyses of the media user's share". We identify with the weight given to these non-discursive aspects while we are also invested in the "metacritical activity that scrutinizes, questions, deconstructs, and revises existing media historiography and the logic it is based upon." See Huhtamo and Galili, "The Pasts and Prospects of Media Archaeology" (Special issue Media Archaeology; guest editors: Erkki Huhtamo and Doron Galili), in *Early Popular Visual Culture* 18, no. 4 (2020): 333–339. https://www.tandfonline.com/doi/full/10.1080/17460654.2021. 2016195 [last accessed 26.07.2022].

Boon as Head of Research at the Science Museum in London. Since our chapters are embedded with these dialogues and have already been published in books by our colleagues (in 2014, in 2019, and 2020 respectively),[44] we did not tear them apart for this book. However, we did revisit them as they were published with intervals of many years, and the inevitable repetitions of parts of the argument had to be taken out. Chapter 4 is the result of an ongoing reflection of how to document and describe hands-on media archaeological experiments in the "Doing Experimental Media Archaeology" (DEMA) research project at the Luxembourg Centre for Contemporary and Digital History (C²DH), funded by the Fonds National de Recherche (FNR).[45]

The DEMA project has been crucial in our endeavour to specify different types of experiments (basic, media-technological, and performative) and to reflect more deeply on the different modes of experimentation in the three experimental systems. Most importantly, the discussions within the DEMA team gave the impulse for the publication of this book and its "twin"-volume on the practice of doing experimental media archaeology by Tim van der Heijden and Aleksander Kolkowski.[46] Although we stress the intrinsic entanglement of "doing" and "thinking" experimental media archaeology throughout the two volumes, we thought it to be useful to have two separate yet highly interrelated books. While this book aims at developing theory about practices, the book by Van der Heijden and Kolkowski aims to offer a practical guide to how to prepare, document, and describe media archaeological experiments in different settings – in a research environment, in artistic settings, and in pedagogical as well as museological contexts. Both volumes share the ambition to learn as much as possible from the doing as from the thinking, and the many cross-references we offer between the volumes aim to demonstrate that "theory" and "practice" make up two sides of one and the same coin. We hope that readers might find this experiment in offering a "slipcase publication" of the two volumes as useful and original as we believe it is, and we would like to thank our publisher for agreeing to such an exceptional constellation.

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44 The first chapter was published in *Technē/Technology*, 272–279. The second chapter was published in *New Media Archaeologies,* eds. B. Roberts and M. Goodall (Amsterdam: Amsterdam University Press, 2019), 45–68. The third chapter was published in *Hands On Media History. A New Methodology in the Humanities and Social Sciences,* eds. Nick Hall and John Ellis (London: Routledge, 2020), 58–75.

45 For more information on the project, see the website: https://dema.uni.lu [last accessed 26.07.2022].

46 Tim van der Heijden and Aleksander Kolkowski, *Doing Experimental Media Archaeology: Practice* (Berlin: De Gruyter, 2023).

What we did while working on this book was to once again think through the method and approaches proposed in the first three chapters, and to add a fourth chapter in order to *make the implicit explicit*. Furthermore, we added a fifth chapter to assess the value of hands-on experimentation for research and education. These fourth and fifth chapters are thus entirely new, as are the Introduction and the Conclusion. For the convenience of readers, we have added an Index of Names, an Index of Subjects, and illustrations of examplary experiments.

Chapter 1 is a plea for three specific things: first, to enrich the study of media by hands-on experimentation; second, to take media objects from the glass cases of museums to help re-sensitize the researcher to past media objects and to create an awareness of the sensory-perceptual and tacit traces left by media in practices of use; and third, to take the materiality of media technologies, as well as the sensorial and tacit dimensions of media use, into account in the writing of the histories of media and technology. In short, it is a bold attempt to question media history from the perspective of an experimental media archaeology by systematically reflecting upon the value and function of hands-on experiments and the methodology, protocol, and procedures used in such experiments.

Fig. 3: Disc-recording workshop with Aleksander Kolkowski and Sean Davis in the framework of the DEMA-project, held in the Media Lab of the University of Luxembourg in February 2020. Photograph by Noëlle Schon. Courtesy of the C^{2}DH / University of Luxembourg.

In Chapter 2, we outline experimental media archaeology as an alternative method to a sense- and object-oriented technology and media historiography. The epistemological potential of an object and sense-oriented experimental access to the field of the history of media and technology is discussed in this chapter, based on experiences in the history of science and in historically informed music performances. The heart of the chapter is devoted to a discussion of a series of media archaeological experiments, executed as part of a search for alternative ways to draft historical statements on past media practices. In these experiments, we focus on the materiality of past media devices beyond their function as sign and evidence of the past and, moreover, on the heuristic possibilities offered by an experimental and experiential approach to these devices. Our main question is how these experiments with historical objects of media technology can be used as sources for a sensorial-focused history of technology and the media.

In Chapter 3, we discuss the relevance of researching the sensorial, perceptual, and experiential dimensions of media use, in order to understand the individual and collective cultural appropriation and acceptation of media technologies. Further, we discuss the relevance of theorising media, media newness and media cycles from the perspective of the user experience – which is central in these experiments. Our aim is to help create conceptual constancy in the field. We return to the concept of "technical media", first, to rethink media newness and novelty effects; second, to address the question as to why the sensorial effects created by technical media would typically affect the media experience and manifest itself in the novelty phase in particular; and third, to discuss the famous *cyclical* effects in the history of media use from the perspective of the user. Lastly, we discuss the implications for media historiographical research, including the relevance of hands-on experiments, to "de-habituate" media history and to re-sensitize researchers to the sensorial and tacit dimensions of media use.

Chapter 4 is devoted to questions of documentation of experimental practice and reflects on the best practices to "translate" the sensorial and implicit knowledge involved in experimentation into documentary evidence that can be used for further research. Building on the phenomenological analysis of the experimental system by Rheinberger (2020), we explore the nexus between the experimental system and the *Aufschreibesystem*, and the interconnectedness of the two practices in the knowledge production process. Inspired by works in the field of sensory ethnography and cultural anthropology (disciplines we visited to study their methods and good practices), we try to describe the overlapping and interfering "spaces" of knowledge production: the space of experiment, the space of protocols and documentation, and the space of ex-post rationalisation or interpretation, eventually leading to the production of some format of scientific output. The chapter ends with some concrete examples of new forms and formats of storytelling in media

history that are based on the use of documentary evidence of media archaeological experiments, such as video essays, podcasts, and virtual exhibitions.

Chapter 5 is devoted to our overall assessment of the value for research and education of the experimental method(s) driving experimental media archaeology. We mainly focus on the affordances with the devices as we have each experienced them in research and teaching. In discussing the value of experimentation with media more broadly, we take into consideration the reflections of our colleagues on their experiences with media devices – among them devices of wonder – in research and teaching, as presented, for instance, in the 2020 special issue of *Early Popular Visual Culture*, edited by Patrick Ellis and Colin Williamson, and discussions of laboratory setups as presented in *The Lab Book. Situated Practices in Media Studies* (2021), written by Darren Wershler, Lori Emerson, and Jussi Parikka.

The book ends with a reflection on the impact of experimental practice on our historical imagination. As we will argue throughout the book, we see experimental media archaeology as a method of historical inquiry of past user

Fig. 4: Presentation of the Kinora replica by Morgane Piet, Claude Wolf, and Tim van der Heijden at the Media Lab of the University of Luxembourg in September 2020. Photograph by Noelle Schon. Courtesy of the C²DH / University of Luxembourg.

practices, sensitising the historian to the material, sensorial and performative affordances of past media technologies. This sensitization, such is our argument, changes the way we experience the doing of historical research. Doing hands-on experimentation produces an embodied knowledge which helps us to "grasp" the meaning of past media practices. As such, it enriches our understanding of a past that will always remain alien to us. The re-doing, re-enacting, or re-making as heuristic practice of historical knowledge production will never produce a "more authentic" experience of that unreachable past, but it affects the way we imagine how that past looked, sounded, or felt. As Ivan Ross argues, to erase historical distance is antithetical to the pursuit of historical knowledge: "to know the past in any regard is to presuppose temporal distance from it".[47] But in addition we argue that interacting with old media technologies in the present has an impact on our historical imagination; it changes our perception, which is, in the words of Collingwood, the "second dimension" of historical thought.[48] We have experienced ourselves that our hands-on experimentation with media objects of the past has altered the way we look at or listen to the mediated representations of the past produced by these apparatuses, as much as it has affected our readings and interpretations of other sources that we usually study when doing media historical research (such as magazines, how-to manuals, advertisements, patents, etc.). We hope that you, readers of this book, as well as of the "practice volume" published along with it, will feel encouraged and inspired to put your hands and heads on the rich body of material remains slumbering in museum depots, amateur collections, or in your handbags, attics, basements, or garages. We are sure that it will touch you!

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47 Ivan Ross, "Iterative Interactions. Old and new media inflections of the historical imagination," in *The Varieties of Historical Experience*, eds. Stephan Palmié and Charles Stewart (London: Routledge 2019), 208.

48 Robin [but more often referred to by his initials R. G.] Collingwood, *The Idea of History* (Oxford: Clarendon Press 1993), 231.

Chapter 1
Experimental Media Archaeology:
A Plea for New Directions

The history of media archaeology has been a history of discourse-oriented analysis in the sense of Foucault. However, it was Friedrich Kittler, the intellectual father of media archaeology, who inspired a focus on the *materiality* of the medium from the early 1980s onwards,[49] one of his aims being to lay bare the epistemological structures underpinning studies in the humanities. While the discourse-oriented (classical) tradition has produced interesting studies focusing on the discursive construction and symbolic meaning of different media technologies, the materiality of media technologies and the practices of use need more attention. Since Foucault's *Archaeology of Knowledge*, media have been widely discussed as fundamentally important in the formation of knowledge and *as such* they are urgently in need of further study. Media archaeology positively helped to constitute the field of media studies and contributed considerably to the broader awareness of how important media are and have been in the past.[50] Nevertheless, since 2013 we have felt that a further step was needed in terms of studying the materiality of the medium to live up to the expectations raised. Instead of investing our energies in a Foucault-inspired discursive enterprise and in an investment in a field which seemed to us saturated at that point in time, we have since opted for an investment in what we labelled experimental media archaeology. Inspired by the idea of historical re-enactment and acknowledging the historian's (the experimenter's) role as co-constructor of the epistemic object, we opt for a form of media archaeology that is driven by a desire to produce

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49 Kittler founded the Media Archaeological Fundus at the Humboldt University in Berlin, which his successor Wolfgang Ernst is using today. See https://www.musikundmedien.hu-berlin.de/de/medienwissenschaft/medientheorien/fundus/media-archaeological-fundus [last accessed 26.07.2022].

50 A particularly rich overview is offered by Wanda Strauven, "Media Archaeology: Where Film History, Media Art, and New Media (Can) Meet," in *Preserving and Exhibiting Media Art. Challenges and Perspectives,* ed. Julia Noordegraaf, Cosetta Saba, Barbara Le Maître, and Vinzenz Hediger (Amsterdam: Amsterdam University Press, 2013), 59–80. For Kittler's impact on the field of film, see Geoffrey Winthrop-Young & Annie van den Oever, "Rethinking the Materiality of Technical Media: Friedrich Kittler, *Enfant Terrible* with a Rejuvenating Effect on the Parental Discipline, a Dialogue," in *Technē / Technology: Researching Cinema and Media Technologies – their Development, Use, and Impact*, ed. Annie van den Oever (Amsterdam: Amsterdam University Press, 2014), 219–239.

experimental knowledge regarding past media usages, developments, and practices. To do so needs one to be practical as well as philosophical, empirical as well as theoretical, experimental as well as conceptual, drawing from psychology as well as sociology, ethnography and cultural anthropology, image theory as well as history. Lastly, experimental media archaeology has an archival drive; it aspires to use the immense collections of media apparatuses waiting in film and other archives for further research.

1.1 Re-Enactment as Heuristic Methodology

Experimental media archaeology is inspired by the idea of historical re-enactment as a heuristic methodology. As such, it is well established in the field of experimental archaeology,[51] and in the history of science.[52] The idea of re-enactment as a heuristic concept of historical understanding had been introduced by the historian and philosopher of history R. G. Collingwood in his seminal study *The Idea of History*.

> Historical knowledge is the knowledge of what mind has done in the past, and at the same time it is the re-doing of this, the perpetuation of past acts in the present. Its object is therefore not a mere object, something outside the mind which knows it; it is an activity of thought, which can be known only in so far as the knowing mind re-enacts it and knows itself as doing so. To the historian, the activities whose history he is studying are not spectacles to be watched, but experiences to be lived through in his own mind; they are objective, or known to him, only because they are also subjective, or activities of his own.[53]

Acknowledging the informative role of re-enactments in the historian's mind in the construction of her historical imagination, we propose to expand Collingwood's idea of "experiencing history" in doing historical re-enactments in practice, not only as "Gedankenexperimente".[54] In engaging with historical artefacts, we aim at stimulating our sensorial appropriation of the past and thereby critically reflecting the hidden and non-verbalized knowledge that informs our engagement with media technologies (in the rest of our book we will speak of tacit

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51 Jeffrey Ferguson, ed., *Designing Research in Archaeology: Examining Technology through Production and Use* (Boulder: University of Colorado Press, 2010).

52 Olaf Breidbach, Peter Heering, Matthias Müller, and Heiko Weber, eds., *Experimentelle Wissenschaftgeschichte* (München: Fink Verlag, 2010).

53 Collingwood, *The Idea of History*, 218.

54 Ulrich Kühne, *Die Methode des Gedankenexperiments* (Berlin: Suhrkamp Verlag, 2005).

knowledge). In doing experimental media archaeology, we want to plead for a hands-on, ears-open, or integral sensual approach toward media technologies.

Fig. 5: Students tinkering with a replica of a Brewster stereoscope. Photograph by Klaas Lommerse. Courtesy of the Film Archive and Media Archaeology Laboratory of the University of Groningen.

1.2 A Second Tongue

As the French philosopher Michel Serres argued in *The Five Senses*, we need a "second tongue" in order to grasp the complex meaning of things. Using the example of wine-tasting, Serres shows that our analytical approach toward things – even to such a highly sensory thing as "wine" – is dominated by our "first tongue": the tongue of language, speech, and words. This first tongue constantly rules out the analytical skills of our "second tongue", the tongue that tastes, that explores, yet that is silenced by language because "the reign of language over lips and tongue is absolute. Imperious, exclusive".[55] Speech and language "anaesthetize" the mouth.[56] It cannot taste well when it is focused on speech. Language dispossesses people of the analytical skills that come with their second tongue. It deprives them of the information generated in a

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55 Michel Serres, *The Five Senses: A Philosophy of Mingled Bodies* (London: Continuum, 2008), 153.
56 Serres, *The Five Senses*, 153.

Fig. 6: During hands-on seminars, students were invited to create their own Thaumatrope. Photograph by Julia Munuera Garcia. Courtesy of the Film Archive and Media Archaeology Laboratory of the University of Groningen.

sensorial way. Serres' choice of words suggests language works as an anaesthetic, a substance that induces insensitivity (e.g., to pain during an operation). Moreover, he argues that of our five senses, smell and taste seem "the least aesthetic".[57] Language has no easy access to the information that can be provided by the senses, and least of all these two; moreover, our aesthetic competence is easily numbed by speech.[58] Therefore, a paralysis of words, however temporarily,

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57 Serres, *The Five Senses*, 153.

58 Serres reflects on the question of why language and speech have no easy access to the senses and why the relation with smell and taste specifically is complicated, and he concludes that they are geared so differently: "[. . .] smell and taste differentiate, whereas language, like sight and hearing, integrates." Moreover, "smells and tastes are transitory, evanescent, ephemeral. Differential." (Serres, *The Five Senses*, 154) From this it follows that smell and taste are less easily studied and indeed more rarely discussed in studies. In our research, too, sound and vision are more dominant than smell and taste, discussions of which are marginal, even compared to touch. Most experiments discussed in the practice guide, volume 2, are focused on information gained with the help of sight and hearing. Relatively few observations target smell and taste. Like most comparable studies in the field of media technologies, in so far as they are experimental and experiential, hands-on, their focus is on vision, sound, and touch, in this order. On rare occasions, without smell being the focal point of a setup or the observations,

may be particularly beneficial for tasting and smelling. "Sapidity slumbers beneath the narcosis of speech", as Serres writes.[59] In order to restore the sensorial and aesthetic quality to things, we need our second tongue and all our senses.

1.3 Anaesthetics

Anaesthetics, in the sense of Serres, is a phenomenon that should be taken seriously in the world of media studies. The term is a portmanteau word, combining *anaesthetic* and *aesthetics*, and it is used by Serres more narrowly for the numbing of the senses by "the first tongue", that is to say, the processing of the perceptual input that is or could be gained through the senses, when hampered by language and speech to the point where no information is being gathered at all. We use the term slightly more broadly in our discussions of the sensorial impact of media for any numbing of the senses or any hampering in the field of sense perception, be it due to language use or to other factors, such as habituation.[60]

Why would this be relevant to media studies? For one, a pivotal feature of media technologies is that their "materiality", their material presence and sensorial impact in the mediating process, tends to escape regular users, even in cases in which these same media created instant and strong aesthetic effects in their novelty phase.[61] Key when dealing with media (as opposed to food or drinks in general) is that such effects may be overlooked once habituation kicks in, and forgotten in retrospect; the sensorial effects triggered by the materiality of a medium wear off in the process of repetitive use, up to a point where

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comments emerged from participants nevertheless, e.g., on a pronounced vinegar smell. They are discussed under the label "vinegar syndrome" in Chapter 2.

59 Serres, *The Five Senses*, 153.

60 At the root of the term *anaesthetics* is a*esthetics*, a term we use in this book in the broadest possible sense, keeping in mind that *aesthetic* is derived from the Greek *αἰσθητικός* (aisthetikos), meaning "aesthetic, sensitive, sentient, pertaining to sense perception", which in turn was derived from *αἰσθάνομαι* (aisthanomai), meaning "I perceive, feel, sense", and related to *αἴσθησις* (aisthēsis), "sensation". See David Cooper, ed. *A Companion to Aesthetics* (Oxford: Blackwell, 2009).

61 We are focusing on the initial historical phase of the medium here, a phase which, as research reveals, may be marked by documents that testify to the individual moments of the first encounters between the medium and its individual users or groups of users, who express arousal effects in some way, either individually or in group debates. A well-researched example is to be found in early cinema studies analysing the first encounters with the Brothers Lumière's cinematograph and their film shows, in Yuri Tsivian *Early Russian Cinema and Its Cultural Reception,* trans. Alan Bodger (Chicago: Chicago University Press, 1994).

the awareness of the medium may disappear altogether.[62] Such an acquired experience of media "transparency" affects not only individual users. It affects the field of media studies in profound ways, including the ways in which the object of study is defined. Therefore, the re-sensitization of expert observers is relevant to the construction of the epistemic object; to define what a "medium" is, that is to say, what we study when we say we study media; and to create consensus in the field in this regard. It has already been noted in a series of studies that the definition of "media" has become so broad that it is now in danger of losing all meaning altogether.[63] Providing a workable definition of its object is nevertheless crucial to any field of studies and perhaps even more so for the field of media studies, as it aims at understanding cultural practices which constantly and rapidly change, and devices and artefacts for which the impact tends to be "transitory, evanescent, ephemeral",[64] first sensed and then forgotten, on and off. It is an ongoing process of use that automatically and inevitably conceals the traces that media technologies initially create in users in terms of sense responses and media awareness. In fact, the study of medium-awareness cycles should help to explain why the construction of the epistemic object and an operational definition has been such a challenge to the field.

1.4 Re-Sensitizing the Observer

We believe that doing historical re-enactments with old media artefacts is a heuristic approach that will offer new sensorial experiences and reflexive insights into the complex meanings and functionalities of past media technologies and practices. It aims at going beyond the "hermeneutics of astonishment" of media archaeology[65] by turning "observers" into "experimenters".

In creating a space for creative exploration and tinkering with either original artefacts or replicas, the researcher will get a first-hand experience of the heuristic difference between studying textual and visual representations of past media technologies and their performative qualities and limitations in real-life interaction and re-use. In engaging with material artefacts in a laboratory environment,

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62 This topic is dealt with more fully in Chapter 3.

63 Particularly outspoken on this topic is Lambert Wiesing, in his "What are Media?" 93–104.

64 See Serres' qualification of smells and tastes, in *The Five Senses*, 154.

65 See Thomas Elsaesser, "The New Film History as Media Archaeology," *Cinémas: Revue d'Études Cinématographiques* 14, nos. 2–3 (2004): 75–117. The relation between (a hermeneutics of) "astonishment" and "wonder" is discussed more deeply in Chapter 5.

Fig. 7: Collective listening to the recording of an Edison wax cylinder produced during the workshop on multi-channel sound recording and reproduction at the Digital History Lab of the University of Luxembourg in February 2017. Photo by Andreas Fickers. Courtesy of the C^{2}DH / University of Luxembourg.

experimental media archaeologists actively co-construct their epistemic object.[66] As we have learned from so-called "laboratory studies" in the sociology and anthropology of science, scientific "facts" or "findings" are always the result of a specific combination of temporal, spatial and social factors. The combination is concrete and radically historical, hence it is *open to change*. The heuristic value of doing historical re-enactments lies therefore not in the reconstruction of an "authentic" historical experience – which is impossible – but in creating a sensorial and intellectual experiment that will demonstrate the differences between textual, visual, and performative approaches to the past.[67] In other words, it is

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66 Hans-Jörg Rheinberger, *Historische Epistemologie zur Einführung* (Hamburg: Junius-Verlag, 2007).

67 Otto Sibum, "Experimentelle Wissenschaftsgeschichte," in *Instrument – Experiment. Historische Studien*, ed. Christoph Meinel (Berlin: GNT-Verlag, 2000), 61–73. See also Bruno Latour and Adam Lowe, "The Migration of the Aura or How to Explore the Original through its

not so much the "correctness" of these re-enactments that is at stake, but their productivity; generally speaking, their usefulness in research is what really matters, as Jonathan Crary has passionately pointed out.[68] The hands-on approach, we believe, solves the "observer's dilemma" of classical media archaeology as described by Wanda Strauven. To put it bluntly: "to touch or not to touch" is simply not a question for us![69] Putting our hands on past media technologies will hopefully create new forms of collaborations between archives, museums, media artists, and media scholars. Moreover, it may help to close the epistemological gap in the research of media that has been left by the explanatory models which assume media to be "transparent".

1.5 De-Auratizing the Artefact

One can actually observe a kind of melancholic retrospection of our analog past. This melancholic retrospection might on the one hand be the result of a generation gap or tension between the "analog born" and "digital born". On the other hand, it might be the product of a tension between the loss or stealthy disappearance of the material evidence of analog technologies in our daily lives, and the massive resurrection of "analog-born products" in digital technologies and the Internet.[70] While the generation gap between analog and digital is basically a demographic and therefore a temporally delimited problem, the stealthy disappearance of material evidence of analog technologies constitutes a specific challenge for cultural heritage institutions such as museums and film and media archives.[71] As media scholars we should make sure that the material traces of these artefacts will not disappear from the digital radar of media scholars.[72] While we are enthusiastic

Facsimiles," in *Switching Codes: Thinking through Digital Technology in the Humanities and the Arts*, ed. Thomas Bartscherer and Roderick Coover (Chicago: University of Chicago Press, 2010), 1–18. http://www.bruno-latour.fr/sites/default/files/108-ADAM-FACSIMILES-GB.pdf [last accessed 26.07.2022].

68 Jonathan Crary, *Techniques of the Observer* (Cambridge, MA: MIT Press, 1990), 7.

69 Wanda Strauven, "The Observer's Dilemma: To Touch or Not to Touch," in *Media Archaeology: Approaches, Applications, and Implications*, ed. Erkki Huhtamo and Jussi Parikka (Berkeley: University of California Press, 2011), 148–163.

70 See Svetlana Boym, *The Future of Nostalgia* (New York: Basic Books, 2001). See also Andreas Huyssen's discussion of nostalgia in his "Nostalgia for Ruins," *Grey room* 23 (2006): 6–21.

71 See the highly interesting reflections by filmmaker Tacita Dean in her contribution to Open Forum, under the title "Film," *FIAF Journal of Film Preservation* 86 (2012): 11–21.

72 For Google being the most powerful of these radars, see Eli Pariser, *The Filter Bubble* (London: Viking Press, 2001). In addition, complicating the disappearance scenario are historical devices

about the possibilities of new digital research infrastructures, we are familiar with the "analog born" and historically minded enough to be aware of the danger of sacrificing the material cultural heritage of "old" media and memory technologies. As media historians, media archaeologists, or media scholars in general, we need the material traces of analog and digital memory technologies not only as physical "witnesses" or "proof" of a period gone by, but as objects that can enlighten and educate our own analytical skills when it comes to the study of past usages of media technologies. A pure focus on "mediated memories" (or media texts) bears the danger of a reductionist perspective on media technologies, decreasing the historical evidence of things to their textual tradition. We are of course aware that the display of physical objects in a museum does not offer a "direct" or "unmediated" access to things. The objects in museums are staged artefacts.

The visual gaze offered to a visitor of a museum is often that of a highly *aestheticized* view, in the sense that artefacts are given the aura of the rare and the beautiful; moreover, these "objects" are staged as "masterpieces", even in museums of science and technology.[73] Yet the "aura of the original", which museums and archives try to stage, is of course a faked one.[74] This "aura" – at least in Walter Benjamin's sense – is destroyed from the very moment an object is detached from its original environment.[75] And it is exactly because of this inevitable "loss of aura" that museums try to create a new narrative and performative framework, aimed at staging a mediated experience of the aura. The re-auratization of objects in (white cube) museums is in fact a process of 'black-boxing', turning things into "objects of desire."[76]

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themselves being reintroduced to new generations; see, for instance, the vinyl resurgence and the recent resurgence of the audiocassette within a generation that has never known it before. These phenomena are being discussed under the label of "technostalgia". See Tim van der Heijden, "Technostalgia of the Present: From Technologies of Memory to a Memory of Technologies," *NEC-SUS. European Journal of Media Studies* 4, no. 2 (2015): 103–121.

73 Tony Bennett, "Speaking to the Eyes: Museums, Legibility and the Social Order," in *The Politics of Display: Museums, Science, Culture*, ed. Sharon Macdonald (London: Routledge, 1998), 29.

74 Sharon Macdonald, "Exhibitions of Power and Power of Exhibition," in *The Politics of Display*, 2.

75 On the loss of aura, see Walter Benjamin, "The Work of Art in the Age of Its Technical Reproducibility: Third Version," in *Selected Writings*, vol. 4: 1938–1940, ed. Howard Eiland and Michael W. Jennings (Cambridge, MA: Harvard University Press, 2003), 251–283.

76 See Bennett, "Speaking to the Eyes"; and Macdonald, "Exhibitions of Power" On the setup of the different "dispositifs" created by (classical) cinemas and museums, see Raymond Bellour, *La Querelle des Dispositifs. Cinéma – Installations, Expositions* (Paris: P.O.L., 2012).
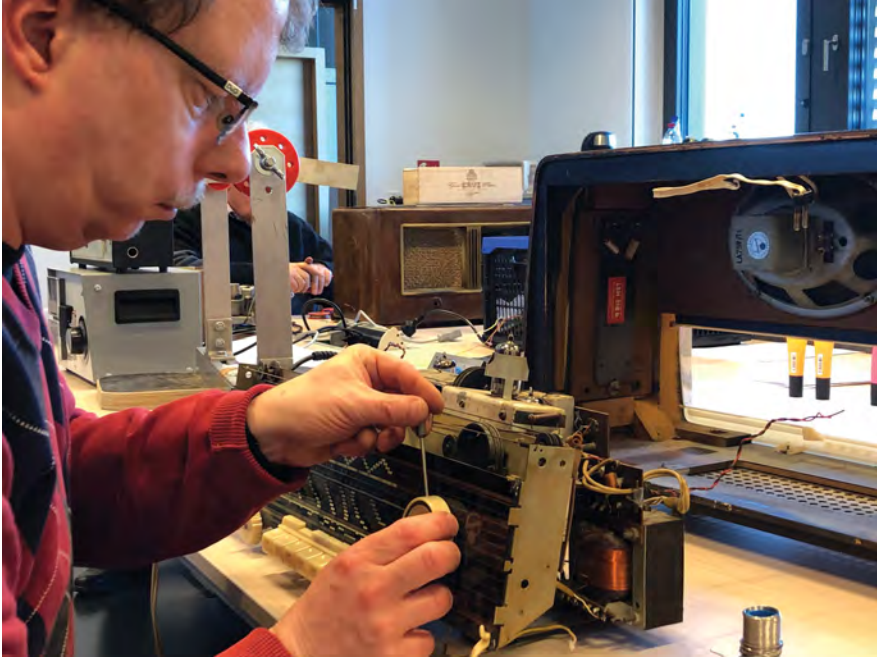
Fig. 8: Radio Repair Café at the Digital History Lab / University of Luxembourg, organised in the framework of the FNR-funded "Repairing Technology – Fixing Society"-project in February 2020. Photo by Andreas Fickers. Courtesy of the C²DH / University of Luxembourg.

Experimental media archaeology (EMA) aims at opening the black boxes and turning museums and archives into laboratories for experimental research. In order to do so, the apparatuses and "artefacts"[77] have to be taken out of the aestheticized, glass-cased exhibition environments of museums and archives and transferred into the exploratory space of a media-archaeology laboratory.[78] Such laboratories create the research environment needed to substantiate,

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[77] As argued in the Introduction, we fully acknowledge the distinction between the film arte-fact (as a conceptual rather than a material thing) and the apparatus artefact (as a material rather than a conceptual thing), as discussed by Giovanna Fossati in *From Grain to Pixel*, pointing out that the tension between material and conceptual artefact is typical of film; see first and last chapters of her book. Note that we suggest that the apparatus in a strictly material sense, as *appareil de base*, is used for re-enactment, e.g., to tease out its performative qualities, inviting research on the artefact as a conceptual thing.

[78] The question *how one can do that* becomes urgent once one decides to do re-enactments in a practical (laboratory) setting. This question is at the core of volume 2, *Doing Experimental Media Archaeology: Practice* by Tim van der Heijden and Aleksander Kolkowski.

empirically and experimentally, the claims of media studies regarding the impact of media technologies on audiences. As central pieces within the experimental system of historical knowledge production, EMA laboratories can turn into spaces that unite hermeneutic traditions of media research in the humanities with the empirical methods of hypothesis testing in the sciences.

1.6 A New Research Agenda

This plea for an experimental approach to media archaeology aims at offering new perspectives for a better historical understanding of past media practices by pleading for re-enactment as a new methodological approach in media research. Doing re-enactments with old media technologies in an experimental media-archaeology lab produces new historical, ethnographic, and empirical knowledge about past user practices and media experiences. It advances our classical repertoire of sources generally used to study past user generations by the co-production of experimental data and ethnographic observations. Experimental media archaeology proposes to go beyond:

- the discursive re-construction of the "configured user" (as staged in advertisements).
- the literary study of the "expert user" (as found in technical and consumer association journals and professional publications).
- the analysis of "amateur users" (as staged in "how to" manuals, popular journals, amateur club publications).
- the co-construction of "remembered usages" (as in oral history sources or performed in ego-documents).

We propose the method of historical re-enactment as it will:

- provide new insights in the sense of time and temporality inscribed in the materiality of media technologies (e.g., the limited amount of recording time in home movie technology or the extensive exposure time of early photography).
- enhance awareness of the spatial and topographical information inscribed in media practices (of both production and consumption).
- enable a better understanding of historical source material such as photographs, films, and audio recordings by handling them as "staged performances" rather than "snapshot versions of life", that is, by probing the "visual" and "sonic" regimes under which they were produced.
- make scholars of past media technologies experience rather than intellectually appropriate the acts of using media as social and cultural practices.

In offering these new insights and experiences, experimental media archaeology can inform us about the "tacit knowledge" involved in the use of media technologies and thereby sensitize us to the role of our senses and our bodies in the human/machine interaction. This sensorial awareness will re-sensitize the media scholar to the social and cultural inscriptions in the materiality of media technologies beyond the discursive level.[79] Playing and tinkering with the material objects in a research lab will de-auratize the artefacts and help to decode the critical role of design as "mediating interface" between technology and users.[80] In reconstructing and re-enacting idealized "how to" user scenarios, experimental media archaeologists are enabled to analyse and experience the differences between the social dynamics of media usages ("ensemble play"), and performing practices ("collective viewing" / "hearing" / "commentating") and their idealized discursive narratives and commercial staging. In promoting *hands-on* research on the apparatus collections of film and media archives and museums, experimental media archaeology aims to turn artefacts into research objects, and to re-establish the experimental tradition of museums. In short, it aims at turning archives and museums into research laboratories rather than mausoleums of past masterpieces.

In doing so, we seek a dialogue between the academic community of film and media scholars with engineers, curators, archivists, and the millions of media amateurs, collectors, and other technical experts who – in a steadily growing number – wish to share their expertise and knowledge in online platforms and home pages. While this incredible source of information is rarely used and even less appreciated by professional scholars, we envision an interactive and participatory online database which gathers all kinds of "information" regarding the development, use, invention, imagination, design, rejection, intellectual appropriation, and resistance of media devices of all times and places.

Media Scholars and Amateurs of All Countries and Disciplines, Hands-on!

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79 See the work of Madeleine Akrich and Bruno Latour on descriptions and inscriptions in "Shaping Technology, Building Society," eds. Wiebe Bijker and John Law (Cambridge, MA: MIT Press, 1992), 259–264.

80 See Fickers, "Design as 'mediating interface'," 199–213.

Chapter 2
Doing Experimental Media Archaeology: Epistemological and Methodological Reflections

2.1 In Search of the Past User

Working on the apparatus collections in museums of science and technology and media archives may well create a growing awareness of the epistemological and methodological problems researchers in the fields of technology and media history are facing. Quite paradoxically, the acute awareness of the historical gap between now and then is easily deepened by the material presence of the "leftovers" of past-media practices, such as magic lanterns, cameras and projectors, radio sets, video recorders, and television sets with old manuals taped on their backs. One reason we seek a physical engagement with these historical artefacts is to stimulate our imagination of the past: to reflect critically on the hidden or non-verbalised, sensorial, corporal, and tacit knowledge that informs our engagement with media technologies. In this chapter, we reflect on ways of doing experimental media archaeology, to plead once again for an integral and sensorial approach towards media technology.

The point of departure of the present approach is the search for alternative ways to draft historical statements on past-media practices. The main question is how historical objects of media technology can be used as a source for a sensorial-focused history of technology and the media. This chapter focuses on the materiality of past media devices, beyond their function as signs and evidence of the past, and on the heuristic possibilities offered by an experimental approach to those devices.[81] Although the approach to the material leftovers is traditionally part of the craft of the historian of technology, especially when reappraising and presenting scientific and technical heritage in a museum context,[82] the sensory and experiential potential of technical objects, which we plead for in Chapter 1, has hardly been broached hitherto in technology or

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81 See also Fickers, "Design als 'mediating interface'".
82 See Rolf-Jürgen Gleitsmann, Rolf-Ulrich Kunze, and Günther Oetzel, "Zwischen Inszenierung und Zeitgeist – Technikmuseen," *Technikgeschichte* (Konstanz: UVK Verlagsgesellschaft, 2009), 92–110.

media historiography.[83] Considerations from the perspective of aesthetics have emerged; they miss the hands-on dimension, however.[84]

On the other hand, in recent years media and technology historiography has frequently put the question of forms of appropriation and ways of using media technologies at the forefront of research. Instead of concentrating on production and invention narratives, technology historiography has focused increasingly on the processes of social construction, social appropriation or rejection, and on the symbolic significance of technology and technological artefacts.[85]

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83 This dimension is not addressed in the classical introductions to the history of technology in the German-speaking world at least. See Martina Heßler, *Kulturgeschichte der Technik* (Frankfurt: Campus Verlag, 2012). Already in 1958, the French philosopher Gilbert Simondon attempted to sketch a philosophy of the history of technology beyond the duality of form and function. (Simondon, *Du monde d'existence des objets techniques* [Paris: Éditions Aubier, 1958]). However, Simondon's works were scarcely appreciated outside France. For the history of the media, Jochen Hörisch presented a study motivated by the history of the senses entitled "Der Sinn und die Sinne", which, albeit inspiring, is often restricted to associative outlines. The French context, however, is more complicated. André Leroi-Gourhan, one of the foundational figures of the French history of technics, advocated throughout his life and work for the necessity of enacting the tools, to rebuild them, to know the crafts in a bodily way. After him (and around him), the field of "technologie" (which sort of became "technologie culturelle" during the 1970s) maintained a tradition of enactment, re-engineering, and bodily knowledge. The hands-on practices in research and education in the humanities today would need more attention. As to the Anglo-American world of film studies more narrowly, an interest in the experiential and aesthetic effects of film technologies (as opposed to film *per se*) emerged in early cinema studies and New Film History, mostly from the 1990s onwards, but it largely missed a hands-on dimension (not an awareness of it but the practice; see the Introduction).

84 Considerations from the perspective of aesthetics have emerged in France since the 1920s, in philosophy and the sub-discipline of aesthetics; e.g., Paul Valéry nourished an interest in the impact of technology on the arts and aesthetics; he inspired Walter Benjamin's seminal essay *The Work of Art in the Age of Mechanical Reproduction*, which took Valery's famous words on the impact of technology on the arts as its motto. In turn, Benjamin's experiential perspective fed into the re-conceptualization of the early film era in terms of an investment in the experiential dimensions of early film technologies performed in early film shows as "attractions" in their own right. See André Gaudreault and Tom Gunning, "Early Cinema as a Challenge to Film History". A new branch on the French tree worth mentioning in this context was proposed by Edmond Couchot in the late 1990s under the label of "techno-aesthetics." See Dominique Chateau's reflection of this lineage in "The Philosophy of Technology in the Frame of Film Theory: Walter Benjamin's Contribution," in *Technē/Technology*, 29–50). See also the reflections on media art experiments assembled in an edited volume by Noordegraaf, Hediger, Saba, and Le Maitre, *Preserving and Exhibiting Media Art*.

85 Representative of this trend, albeit with a more polemical undertone than others, is David Edgerton, *The Shock of the Old. Technology and Global History since 1900* (London: Profile Books, 2008).

Similar changes of perceptions in media historiography resulted in describing and analysing users of media technology with the more assertive, action-oriented concept of "user", instead of the socio-economic and media-studies categories of "audience" and "consumer".[86]

2.2 The Milkshake Mistake

A keen awareness of the user in media research was partly created by the changes in media use in the 1990s: the term "new media" (which now seems a bit corny) was aptly coined in opposition to the old (news) media – television and newspapers – of which the practices of use were, to a large extent, automatized: the materiality of these old media technologies and the strategies of use had become so familiar that they had become more or less invisible (or "transparent" if you will) to the users themselves. In sharp contrast to this, the new (social) media of the 1990s were remarkable, visible, exciting, and material for debate. These new social media triggered new forms of use, which needed new forms of media research, with an apt focus on the users, to avoid the so-called *milkshake mistake*. The term refers to a type of mistake in research in which one forgets to include an analysis of the actual users and their actual, changing practices of use. It has been named a *milkshake* mistake after a failed research project on milkshakes instigated by McDonald's: while a team of researchers was focusing solely on the product, the milkshake – carefully studying every option to improve the product – the whole team failed to observe that former milkshake users, commuters, had started to buy their milkshakes as a "breakfast on the go" at other places than McDonald's in the meantime, which only one of the researchers found out, and only afterwards. Had they shifted from *product* to *user* studies earlier, the mistake would not have been made. Keeping this in mind, new media and social media research shifted focus from product to usage, and this has been crucial, as Clay Shirky argues in his 2010 study of

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86 See John Ellis, "TV and Cinema: What Forms of History Do We Need?" in *Cinema, Television & History: New Approaches*, ed. Laura Mee and Johnny Walker (Newcastle-Upon-Tyne: Cambridge Scholars Publishing, 2014), 12–25. See also Nelly Oudshoorn and Trevor Pinch, eds., *How Users Matter: The Co-Construction of Users and Technologies* (Cambridge, MA: MIT Press, 2003), and the contributions in *Technikgeschichte* 3, no. 76 (2009), which deal with the relationship of the history of design and of technology.

the new digital technologies of the 1990s, which first turned consumers into social users, then into collaborators.[87]

A challenge for all approaches to reception and user history – both for the history of the media in the broad sense and a history of media technologies in the narrow sense – is the question of sources and, by implicit extension, historical hermeneutics: how are historically relevant statements on ways of appropriation, ways of use, or rejection strategies of media technologies constituted in retrospect?[88] And how constitutive are certain types of sources in the semantic construction of certain types of users or categories of ways of use? Monika Röther addressed this issue systematically in *The Sound of Distinction* (2012). She linked four different dimensions of sound technologies to the analysis of certain types of sources: first, the analysis of the materiality of the object itself; second, the interpretation of sources, in which manufacturers and professionals enact potential appropriation strategies (e.g., in advertising); third, the analysis of expert discourse found in product-test magazines and consumer magazines; and fourth, those documents and sources that provide information on the actual appropriation and use of media technologies (e.g., ego documents and oral history interviews).[89] In developing Röther's systematisation further, eight (user) perspectives will be presented below, under which the relationship with different types of sources and specific user categories and discourses can be differentiated and broadened.

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87 See Clay Shirky on the milkshake mistakes in social media research in his book *Cognitive Surplus. How Technology Makes Consumers into Collaborators* (New York, London: Penguin Books, 2010), 12–20.

88 There is of course a long tradition of reception research in the history of the media, which focuses on consumer behaviour or the appropriation of media products (programmes, formats). However, the question of technological requirements and the conditions of media appropriation usually play no role in this research tradition. On the history of reception research, see Cécile Méadel, *Quantifier le public. Histoire des mesures d'audience à la radio et la télévision* (Paris: Economica, 2010). See also Richard Butsch, "Audiences. Publics, Crowds, Mass," in *The Handbook of Communication History*, ed. Peter Simonson et al. (London: Routledge, 2013), 93–108.

89 Monika Röther, *The Sound of Distinction. Phonogeräte in der Bundesrepublik Deutschland. Eine Objektgeschichte (1957–1973)* (Marburg: Tectum Verlag, 2012), 34–62.

2.3 Different Types of Sources, Different User Categories, Different Discourses

The development of eight perspectives on users, as presented in the table below, is intended to provide a more complex vision of the diverse and alternative constructions of users in specific types of sources, and thus a more effective approach to the actual historical complexity in the (scholarly) historical re-enactment of past ways of using media technologies. Only one of the suggested user perspectives will be explored in greater depth here, namely the one proposed by experimental media archaeology under the label of "re-enacted users", since it is expected to make an interesting contribution to a media and technology historiography that draws inspiration from the *sensing* of the past.

Needless to say, perhaps, the "types of users" presented here are ideal-typical constructions which may (and should) fall victim to historical re-enactments in individual cases. In spite of the different semantic meaning, "user" and "use" are not differentiated in the typology which follows, but these terms are used as synonyms, as in the source material.

If we look at the types of sources that were used in previous studies for the historical reconstruction of users, expert sources are clearly dominant in historical technology-oriented reconstructions (e.g., *Technikgeschichte*). Expert-made sources such as perception reports, laboratory reports, (production) logbooks, and publications in expert journals are typically driven by production-oriented and purpose-oriented questions and they tend to be directed at other expert users. For example, a chain of expert discussions in the field of the production, dissemination, implementation, and use of expert projections facilities may be aimed at testing the setup in follow-up experiments in cinemas with a team of projectionists suggesting technical amendments to the expert producers / inventors. However rich in terms of their wealth of test material, expert users' main focus, or expertise, is such tests and not the *actual, historical use* of a technology in the socio-cultural context of the day nor its actual place in technology or media history. In addition, expert users may be rather too positive if not utopian about the future of "their device". Needless to say, this is a problem for media histories based on these sources. The many *milkshake mistakes* made by experts predicting the futures of a technology in utopian terms are abundant in media history, and they are indicative of their theory-induced blindness with regard to actual, historical user practices.

Ironically, the milkshake mistakes created exquisite material for alternative and amusing media archaeologies; moreover, they begged for a critical take on expert-induced blindness. In many ways, media archaeology responded to this not so much by researching actual user practices, but rather by an epistemological

Tab. 1: Typology of user practices.

User perspectives	Characterisation of user types	Types of sources
1. Imagined users	Imaginative, utopian or dystopian projections of past and future ways of use	Science fiction and fantasy literature and film; comics and cartoons; radio plays, television series, games
2. Configured (or prefigured) users	Strategies of use configured and prefigured, pre-planned and promoted by the industry, manufacturers, and marketers	Advertisements, posters, billboards, commercials, manuals, patents, apps ("applications")
3. Expert users	Possible ways of use based on a scientific, empirical, and experimental assessment conducted by expert discussion (promises of performance based on testing)	Technical literature, test reports, perception reports, logbooks, laboratory records, product-test magazines, (online) expert publications
4. Amateur users	Forms of the actual appropriation and user tactics discussed in exchange-oriented publication media	Popularising periodicals, fan sites, blogs and vlogs, how-to manuals, videos, club magazines
5. Remembered users	Remembrance of certain ways of use constructed in oral history interviews, e.g., subjective description of user experiences recorded in ego documents	Oral-history interviews, diaries, ego documents, surveys, historical and ethnographic documentation/ documentaries
6. Re-enacted users	Ways of appropriation and use generated by re-enactment in experiments; or teasing out tacit knowledge within experience through re-enactment	Objects, devices, re-enactments, ethnographic records, scripts, laboratory records
7. Artificial users (or artists)	Media technologies re-enacted and repurposed by artificial appropriation; usually focused on the perceptual and mimetic potential (reality construction dimension) of media devices	Artificial installations, objects, devices, audio and video installations
8. Simulated users	Re-enactment of user behaviour through computer aided simulations and statistical assessment of possible scope for actions and processes	Simulation software, statistical data, user profiles

critique of the knowledge produced in a media historiography that leaned on production-driven narratives and utopian fantasies. It also responded by constructing alternative narratives and quirky and marginal media histories (plural) or what Siegfried Zielinski emblematically and programmatically called "variantology".[90] The "alternative" sources are most often used to describe the historical and contemporary potentiality of media and communication technologies, but not to reconstruct their actual dissemination or appropriation or historical use. Therefore, many media-archaeology studies are primarily interested in those types of sources, which allow the imagined or configured users to come to the fore, as is the case, for example, in literary presentations, advertising,[91] or patents.[92] This media archaeology of the imaginary or even utopian potential, which is ascribed to all new media and communication technologies, has led to numerous historical-discourse studies, which have made an important contribution to the cultural history of the media and media technologies.[93] Reflection in terms of media archaeology is also encountered in the field of the artistic appropriation of past and present media technologies.[94] A shared feature of most studies in the field of the history of technology as well as media archaeology is that they use almost exclusively textual and visually argued types of sources in their reconstruction of media practices.

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90 See Siegfried Zielinski, "Media Archaeology," *CTheory*, https://journals.uvic.ca/index.php/ctheory/article/download/14321/5097 [last accessed 26.07.2022]. See also the discussion of approaches and methods assembled under the name of media archaeology in an overview article by Wanda Strauven, "Media Archaeology: Where Film History, Media Art, and New Media (Can) Meet," in *Preserving and Exhibiting Media Art*, ed. Noordegraaf et al., 59–80.

91 Interesting examples are to be found in studies by Erkki Huhtamo, such as "From Kaleidoscomaniac to Cybernerd. Towards an Archaeology of the Media," *Leonardo* 30, no. 3 (1997): 221–224, and "Elements of Screenology: Toward an Archaeology of the Screen," *ICONICS: International Studies of the Modern Image* 7 (2004): 31–82.

92 As an example of a media archaeological study, which is in essence based on patents as a type of source, see Albert Kümmel-Schnur and Christian Kassung, eds., *Bildtelegraphie. Eine Mediengeschichte in Patenten (1840–1930)* (Bielefeld: Transcript, 2012).

93 See, for example, Jeffrey Sconce, *Haunted Media. Electronic Presence from Telegraphy to Television* (Durham: Duke University Press, 2000). See also Marita Sturken, Douglas Thomas, and Sandra J. Ball-Rokeach, eds., *Technological Visions. The Hopes and Fears That Shape New Technologies* (Philadelphia: Temple University Press, 2004), and Erkki Huhtamo, *Illusions in Motion. Media Archaeology of the Moving Panorama and Related Spectacles* (Cambridge, MA: MIT Press, 2013).

94 See Jussi Parikka, "Practising Media Archaeology: Creative Methodologies for Remediation," in *What Is Media Archaeology?* ed. Jussi Parikka (Cambridge: Polity Press, 2012), 136–158.

2.4 Insight into Actual User Practices and the Creation of Cognitive Surplus

In sharp contrast to the expert users, amateur users typically provide valuable source material to historians of technology and media historians interested in *actual user practices*. Regardless of the number of technical skills these two groups have in common, the big difference between them is that experts tend to focus on the product, amateurs on the actual use. It follows that historians working on expert-related sources tend to focus on product information, while historians working on amateur-related sources favour actual (historical practices of) use. Furthermore, amateur source material is easily accessible, whereas expert sources (test reports, logbooks, laboratory reports, and so on) may be protected from a potential rival's eyes by big commercial companies in charge of the production and testing. Quite contrary to this, amateurs share their insights into the actual appropriation of all sorts of technologies while they discuss user tactics in exchange-oriented publication media.[95] Moreover, amateurs typically form social communities for sharing their love for and knowledge of technologies they use, and produce a "cognitive surplus" that is valuable for society at large, as Clay Shirky argued.[96] As such, amateurs produce ready and rich source material, which is highly relevant for technology and media historians interested in the actual user. It helps them to study appropriation strategies and shifts in the actual use of media technologies, including so-called "breaking practices" and "failures" in use.[97]

Sources which favour more of an event-historical or phenomenologically oriented analysis perspective, such as mnemotechnical ego documents, devices,

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95 For instance, see the cascade of examples provided by Lori Emerson in the context of her Lab at the University of Colorado, Boulder: http://mediaarcheologylab.com/about/ [last accessed 26.07.2022].

96 The term "cognitive surplus" has two meanings: extra or spare time (surplus) gained from skipping passive activities such as watching TV; and the cognitive extras (surplus) created in the extra time gained in this way. Clay Shirky's book is in many ways an ode to this new type of digitally empowered knowledge sharing, as well as to the amateurs who create the *surplus* and generously share it with the societies they live in. See Shirky, *Cognitive Surplus. How Technology Makes Consumers into Collaborators* (New York, London: Penguin Books, 2010), 12–20 and 161–183.

97 Such "breaking practices" and "failures" in use have proved to be relevant for media research in general and for re-enactments in particular, and a discussion of "failures" during experiments will follow below.

installations or simulations, have largely been neglected hitherto in historical research.[98]

2.5 Re-Enactment: Grasping the Materiality and Sensuousness of Historical Objects

What is the epistemological potential of an experimental approach for a media historiography with an interest in sensing the past? Our main aim here is to explore and outline the added heuristic value of an experimental expansion of the methodological repertoire of classical media archaeology, which is geared towards discourse analysis. As valuable as these studies are for the historical reconstruction of past expectation horizons, they have very little to say about the complex process of the concrete appropriation and use of devices and objects in people's everyday life. According to Charles Bazerman, who speaks of "heterogeneous symbolic engineering",[99] or Mikael Hård and Andrew Jamison, who speak of "intellectual appropriation",[100] such processes always result from a complex interplay between imagination, invention, and marketing strategies.

What are the main conceptual and methodological features of re-enactment? And what are the practical and epistemological consequences of such a hands-on approach and the value of re-enactments as a heuristic tool for a technological history of the media? For our discussion, we focus on our experiences with a series of small experiments, executed in our own research and teaching practices, to frame suggestions, and lessons learned. At issue in what follows is a search for methods and possibilities to "grasp" media and communication

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98 A recent example of use of such documents is the ADAPT research project on the history of television technology initiated by John Ellis. See online: http://www.adapttvhistory.org.uk/ [last accessed 26.07.2022]. Older examples of historiographical research which favour more of an event-historical and phenomenologically oriented analysis perspective can be found in the field of early film studies. New Film History, a term coined by André Gaudreault, was developed by film scholars in a constructive cross-over with film archivists assembled at the International Federation of Film Archive (FIAF), during the ground-breaking 1978 FIAF conference in Brighton. It helped to reframe the epistemological underpinnings of the field, and resulted in a readdressing of the role that events, audience experiences, archives, source materials, artefacts and technologies play in (early) cinema research. See André Gaudreault and Tom Gunning's explanation of a new take on film history in their seminal "Early Cinema as a Challenge to Film History".

99 Charles Bazerman, *The Language of Edison's Light* (Cambridge, MA: MIT Press, 1999).

100 Mikael Hård and Andrew Jamison, eds., *The Intellectual Appropriation of Technology. Discourses on Modernity*, *1900–1939* (Cambridge, MA: MIT Press, 1998).

technologies in their concrete materiality and tangibility. *Grasping* is to be understood here as a hermeneutical act in the sense of Ernst Cassirer's use, which is to say that it comprises both the intellectual process of comprehending as well as the sensory-physical appropriation of getting a grip on things.[101]

In our view, one possibility for methodologically implementing Cassirer's hermeneutic concept of "grasping" (within the meaning of critical and self-reflective historical scholarship) lies in the transposition of the concept of historical re-enactment in experimental practice. The idea of making re-enactment useful as a heuristic concept for historical scholarship stems from the British philosopher R. G. Collingwood, as we explained in Chapter 1. If Collingwood's idea is expanded to a concrete, hands-on and experimental dimension of knowledge generation, then the historian who is interested in objects and sensory aspects can gain concrete experiences with the physiological and sensory qualities of communication and media technologies. Through hands-on experiments, these technologies can be grasped in their technical, material, and sensory dimensions. In line with this, we propose a playful construction of the epistemic object[102] to be put in the hands of the historian/experimenter who "becomes sensitive to everything which evades pure description", as Michel Serres suggests in his plea for a history of the senses.[103]

Drawing inspiration from experiences in the experimental history of science,[104] experimental archaeology,[105] and historically informed performance in music,[106] experimental media archaeology is geared to generating "knowledge

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101 On the notion of *grasping*, which in terms of etymology implies the hand and the tactile, see Ernst Cassirer, "Form und Technik," in *Symbol, Technik, Sprache. Aufsätze aus den Jahren 1927–1933*, ed. Ernst Wolfgang Orth and John Michael Krois (Hamburg: Meiner Verlag, 1995), 52.

102 On the construction of epistemic objects, see Rheinberger, whose reflections are instructive ("Experiment: Präzision und Bastelei," in *Instrument – Experiment. Historische Studien*, ed. Christoph Meinel [Berlin: GNT Verlag, 2000], 52–60).

103 Serres, *The Five Senses*.

104 For a detailed reflection on the methods, concepts and findings of the experimental history of science, see Olaf Breidbach et al., eds. *Experimentelle Wissenschaftsgeschichte* (Paderborn: Fink, 2010), 13–72.

105 Michael B. Schiffer and James M. Skibo, "Theory and Experiment in the Study of Technological Change," *Current Anthropology* 28, no. 5 (1987): 595–622; Stephen Saraydar, *Replicating the Past: The Art and Science of the Archaeological Experiment* (Long Grove: Waveland Press, 2008); Ferguson, ed., *Designing Experimental Research in Archaeology*; Michael Schiffer, *The Archaeology of Science. Studying the Creation of Useful Knowledge* (Heidelberg: Springer, 2013).

106 Colin Lawson and Robin Stowell, *The Historical Performance of Music: An Introduction* (Cambridge: Cambridge University Press, 1999); John Butt, *Playing with History: The Historical Approach to Musical Performance* (Cambridge: Cambridge University Press, 2002); Caroline

Fig. 9: Re-enactment of the production of so-called "Lichtenberg figures" during a hands-on workshop with the historians of science Wolfgang Engels and Falk Riess at the DEMA-workshop "Performing Media Archaeological Experiments" in the Media Lab of the University of Luxembourg in December 2020. Photo by Andreas Fickers. Courtesy of the C^{2}DH / University of Luxembourg.

that provides a springboard for action", which underscores the performative dimension of media and communication technical objects in practice. This means that the intrinsic performative quality of devices (which tend to be plastic in media devices) and the interaction between user(s) and object become perceptible in the experiment and are then described and reflected upon. Described by Breibach et al. as the cognitive mode of "heuristic groping", his process expounds, in a playful and reflective manner, the relationship between knowledge that provides a springboard for action, theoretical knowledge, and ignorance.[107] It is the tension between the exploratory nature of theoretical reasoning and the embodied nature

Bithell and Juniper Hill, eds., *The Oxford Handbook of Musical Revival* (Oxford: Oxford University Press, 2014).

107 O. Breidbach et al., "Experimentelle Wissenschaftsgeschichte," in *Experimentelle Wissenschaftsgeschichte,* eds. O. Breidbach, P. Heering. M. Müller and H. Weber (Paderborn: Fink, 2010), 13–72.

of practical knowledge that produces learning experience with a sustainable impact, or, in the German terminology of Sönke Ahrens, "Bildung".[108]

2.6 The Archive as Laboratory: "Thinkering" as Style of Thinking in Education

Since 2010, we have done some small tests, in research as well as education, with experimental media archaeology as a heuristic method, trying to find out whether it can function as a tool that provides new access to the study of past-media practices and appropriation by assigning to the historian or archaeologist the role of an experimenter instead of that of a reader or observer. A prerequisite for this change in roles is the creation of a space where it is possible to experi-

Fig. 10: Students drawing the interior mechanisms of a Zeiss Ikon 35 mm projector as they remembered and then completing the drawing with how they imagine it. Photograph by Julia Munuera Garcia, courtesy of the Film Archive and Media Archaeology Laboratory of the University of Groningen.

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108 The experience of failure or not succeeding acquires an exceptional function in this process – an insight which is of central importance for the planning or the structure and organisation of experiments. See S. Ahrens, *Experiment und Exploration. Bildung als experimentelle Form der Welterschließung*. (Bielefeld: Transcript Verlag, 2011), 17–21; 266–275.

ment either with communication and media originals or with replicas in a creative and playful manner – what Erkki Huhtamo has designated as "thinkering".[109] This approach is not used by us as a replacement of conventional media archaeology or media history methods, but rather as a methodological supplement, whose greatest heuristic potential may well lie in the didactic, educational front, as we discovered.

Fig. 11: Students experimenting with a Magic Lantern projection. Photograph by Julia Munuera Garcia. Courtesy of the Film Archive and Media Archaeology Laboratory of the University of Groningen.

A preferred space for such experiments to be executed with students are university collections and archives, such as the Groningen Film Archive & Media Archaeology Lab. It is one of the prerogatives of such archival collections embedded in universities that most objects may actually be touched and manipulated in hands-on experiments, as they are neither unique, nor rare, nor valuable. On occasion, the archive's educational space is used as a *laboratory*: what Simone Venturini called a "handmade environment for using the technology available and

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109 Huhtamo, "Thinkering with Media," 33–39.

the human and corporal reclaiming of the technology".[110] After a tour through the archive, we present a series of devices to students as part of their introduction to film and media studies. They are invited to touch, operate, and "play" with some of the historical devices in the archive, a magic lantern, lantern slides, a Zeiss Ikon 35 mm projector, an anamorphic lens, a replica of a 19th-century stereoscope, and a series of optical toys, a phenakistoscope, a zoetrope, a thaumatrope, a flipbook, and view master among them.[111]

The invitation to tinker with the Zeiss Ikon 35 mm projector (or what is left of it), with a hand crank that still functions, allows students the fun of hearing the (to some familiar) sound of the sewing machine when the pull-down mechanism goes up and down, and the dry clicks of the Malteser cross and the flapping of the projector's double-bladed shutter, which is relatively loud and, without fail, raises questions about film's silent era. Silent? Really?! We have been doing these experiments yearly since 2010, with 100 to 200 students from all over the world, divided in small groups of about 20 (the language of instruction is English). Often, a quiz-like buzz of asking and guessing is triggered amongst the students by these small hands-on operations. Where do these funny (sewing-machine-like) sounds come from? Was the machine meant to make such noises? What is that repulsive smell coming from the film reel? (vinegar syndrome).[112] What is this?! A thaumatrope?[113]

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110 Simone Venturini, "Technological Platforms," in *Preserving and Exhibiting Media Art*, ed. Noordegraaf et al., 202.

111 On the importance of playfulness in learning with technical objects see Barry Brown and Oskar Juhlin, *Enjoying Machines* (Cambridge, MA: MIT Press, 2015); Marion Saxer, ed., *Spiel (mit) der Maschine. Musikalische Medienpraxis in der Frühzeit von Phonographie, Selbstspielklavier, Film und Radio*. (Bielefeld: Transcript, 2016).

112 These small experiments with film and media technologies basically focus on vision, sound, and touch. On this one occasion, though, without smell being the focal point of the setup, smell does become a point of attention, as the vinegar smell is so strong, so pronounced, that observations are made and verbalised and comments emerge from the participants. The observations tend to be discussed under two labels: (1) the "vinegar syndrome", which is among the basics of film preservation; the symptoms are a pungent vinegar smell (hence the name), due to bacteria on the film reel, which eventually cause a disintegration of the emulsion and the shrinkage of the film carrier. See https://www.filmpreservation.org/pres ervation-basics/vinegar-syndrome [last accessed 26.07.2022]; (2) smell being hard to verbalise, hence remember, and the tongue being poor in the recognition of tastes, which move in a simple, rudimentary spectrum of four: *sweet, sour, astringent, acidic* . . . unless the nose helps out. See the discussion of Michel Serres' reflections on smell and taste in Chapter 1; there and here, we are drawing from Serres, *The Five Senses*, 153–154.

113 The thaumatrope is a device made and meant for use in an educational or entertainment context and was discussed as such in the Introduction. It indeed makes for a gratifying choice, not only because it is so easy to manipulate, but also because it instantly and unfailingly creates a wow effect as well as an exemplary senso-perceptual experience, which is interesting in

A zoetrope? A view master? A flipbook? A phenakistoscope?[114] An anamorphic lens? What does an anamorphic lens *do*? (A short recording of the 2016 experiment can be found on Vimeo).[115]

It should be stressed here that most of the actions by the students in this specific introductory class are not framed for them to experience the technology's proper place in history or to learn how to operate it in terms of former use. Students are simply invited to touch, smell, hear, look, experience, and play with the device; indeed, most of the students' actions look beyond the normal use or purpose of the device (as is visible in the recording on Vimeo). It is in no way a technology class for students who need to learn how to make or repair technologies. In many ways, our educational experiments are much closer to what artists and artist-amateurs or art students do in their studios (e.g., the students of the Amsterdam Rietveld Academy for the Arts, Department for Unstable Media, with whom we have started doing experiments too). They do tinkering experiments with media technologies, which are not useful for a technician, but are highly interesting for an artist in terms of testing the sensorial and expressive, performative potential of a device. Such "aesthetic experimentations" with media devices are described by Simone Venturini as "practical operations on the technology and material of a reflective nature".[116] Emilio Garroni typifies them as "a mainly meta-operational activity".[117]

What makes these small operations so effective in educational terms is the strong aesthetic and performative impact of media devices. The first thing students experience and comment on are the sensorial and expressive dimensions

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an educational context to reflect upon. They have been called "instruments of demonstration" and "philosophical devices" for good reasons. See Tom Gunning, "Hand and Eye," 500–501.

114 As Tom Gunning wrote in 2012 ("Hand and Eye," 498–499): "These optical devices display a double function. On the one hand, they produce an image and a visual experience; on the other hand, they seek to demonstrate the processes of visual perception through their operation. Intensely self-reflective, they use a technology, a specific and often simple hand-held device, in order to create a visual effect and to *draw attention to how that effect is generated*. As instruments of demonstration, they both generate astonishment and provide explanation. Some of these devices – such as the phenakistoscope, the zoetrope, or the flipbook – produce a moving image and thus have a clear place in the development of motion pictures. By contrast, the thaumatrope's technology is much simpler, yet its simplicity only makes the thaumatrope's perceptual and phenomenological paradoxes – its 'visual trick' – clearer."

115 This short compilation was made in February 2016 by Klaas Lommerse, a former Masters student of film and trainee of the film archive. Trustee of the film archive, Bernd Warnders, was part of the experiments, as were Tom Slootweg and Erik Buikema, staff members from the film programme. You will find the clip here: https://www.youtube.com/watch?v=guHEQhp3ViI.

116 Venturini, "Technological Platforms," 202.

117 Cited in Venturini, "Technological Platforms," 202.

of the experience. As a result, the smallest hands-on experiment already triggers the imagination and indeed helps the students to reclaim technology corporally, in the words of Venturini. In fact, there is so much fun and laughter involved that one forgets that normally students claim to suffer from technophobia when asked to read a chapter on historical technology.

In the hands-on didactic context, we also use drawing as an additional tool to explore experiences. Once the tinkering stops and the devices are taken away, the students are invited to draw from their memories, to re-imagine and then draw a picture of one of the devices (often the Zeiss Ikon 35 mm projector). What we learned from this is that there is an additional element of regressive pleasure in all these activities; for example, being invited in an academic context to play with toys and to make a drawing are two things, many students told us, they had not done since their childhood. From these small introductory experiments, we have come to understand that these additional pleasures, too, make the hands-on experiments a valuable educational tool, which can in some ways kick-start reading about technology and media history.

If *experimenting* is understood in the sense of Sönke Ahrens, that is, as a differentiation of the exploratory and experimental forms of discovering the world and as a style of thinking that is characterised by a process of collecting, tinkering, and translating findings into knowledge instead of relying on a certain theory, then experimental media archaeology can make a contribution to (media) historical *education,* which expands the conventional forms of historical learning to a sensorial dimension of imagining the past.[118] Following Ahrens, learning as an "explorative form of discovering the world" and education as an "experimental form of discovering the world" constitutes a complementary relationship of necessity.

2.7 Reflections on Experimenting in Home Mode

If laboratories or workshops are seen as spaces of action, where different actors and actants engage in a complex interaction, the question arises how this space is to be designed for media-archaeology experiments where the focus of attention is, apart from the technical devices themselves, on evoking the place where these devices are appropriated and used, and the social constellation in which

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118 Ahrens, *Experiment und Exploration,* 271.

this occurs.[119] Since the home can be considered the privileged locus for the appropriation and use of communication and media technologies, the arrangement of a domestic environment seems entirely appropriate for conducting media archaeology experiments. As the "central integration power" (Gaston Bachelard)[120] and the "museum of the soul" (Mario Praz),[121] the home is the symbolic place for experiencing the whole of life, and as such often also the place for the "domestication" of new communication and media technologies.[122] The living room has a special role to play as a material and social ensemble, according to Hans Peter Hahn, and as the privileged space of conspicuous consumption.[123] The biographies of objects and their users are intertwined in the living room and are thereby consolidated into a socio-technical topography.[124] According to this hypothesis, this special topography should be taken into consideration in the experimental re-enactment, in order not only to analyse the "language of things" but also to try the playful "dialogue with things".[125] Experimenting in "home mode" in an artificially constructed laboratory space – be it in the educational setting (e.g. in schools or universities) or in a research environment – therefore asks for a careful reflection on the impact of the spatial dispositif of historical media technologies.

   An initial media archaeology experiment in the domestic appropriation of family films in different media technology devices has shown the importance of understanding the experiment also as a social, communicative, and collective practice. This experiment was conducted as a "performance" at the International Orphan Film Symposium 2014 in Amsterdam, and stemmed from a research project on the history of family films.[126] The media-archaeology experiment featured

119 The preparation and spatial organisation of experiments in EMA are described at length in Van der Heijden and Kolkowski, *Doing Experimental Media Archaeology: Practice*.

120 Gaston Bachelard, *Poetik des Raumes* (Frankfurt am Main: Fischer Verlag, 1987), 33.

121 Mario Praz, *Histoire de la décoration d'intérieur* (London: Thames and Hudson, 1994), 19.

122 On the concept of domestication, see Roger Silverstone and Eric Hirsch, eds., *Consuming Technologies* (London: Routledge, 1994).

123 Hans P. Hahn, "Von der Ethnografie des Wohnzimmers," in *Die Sprache der Dinge*: *Kulturwissenschaftliche Perspektiven auf die materielle Kultur*, ed. by Elisabeth Tietmeyer et al. (Münster: Waxmann, 2010), 13.

124 See Ian Woodward, "Material Culture, Narratives and Social Performance. Objects in Contexts," in *Understanding Material Culture*, ed. Ian Woodward (London: Sage, 2007), 151–168.

125 Hahn, "Von der Ethnografie des Wohnzimmers," 16. See also Stephen H. Riggins, "Fieldwork in the Living Room. An Autoethnographic Essay," in *The Socialness of Things: Essays on the Socio-Semiotics of Objects*, ed. Stephen Riggins (Berlin: De Gruyter, 1994), 101–147.

126 This NWO-supported research project with one postdoc and two PhDs was headed by Andreas Fickers; three books on the project, by Susan Aasman, Tom Slootweg, and Tim van der Heijden respectively, have subsequently been published: Annamaria Motrescu-Mayes and

three scenes of the domestic use of amateur film technology, based on a prepared script, representing the different possible amateur film dispositifs: first, the "8mm dispositif" (with 8mm film camera, projector, and projection screen), second, the "video dispositif" (with video camera, video recorder, and television set), and third, the "mobile telephone dispositif" (with the mobile telephone as camera, recorder, and playback medium). The purpose of this experiment was to attempt to confront the theoretical considerations of experimental media archaeology with practical experiences. In other words, it aimed to juxtapose explorative speculation with experimental-practical knowledge. A short film montage of the experiment is available on Vimeo.[127]

Fig. 12: The project team during their lecture performance "Staging the Amateur Film Dispositif" at the Orphan Film Festival at Eye Filmmuseum in Amsterdam, March 2014. Screenshot of video produced by Tim van der Heijden. Courtesy of Maastricht University.

Susan Aasman, *Amateur Media and Participatory Cultures: Film, Video, and Digital Media* (London: Routledge, 2019); Tom Slootweg, *Resistance, Disruption and Belonging: Electronic Video in Three Amateur Modes* (Groningen: University of Groningen, 2018); Tim van der Heijden, *Hybrid Histories: Technologies of Memory and the Cultural Dynamics of Home Movies, 1895–2005* (Maastricht: Maastricht University, 2018).

127 A short film montage of the experiment / "performance" produced by Tim van der Heijden is available at: http://vimeo.com/95314562 [last accessed 26.07.2022].

Perhaps the greatest cognitive value of the public staging of the experiment lay in what one of the researchers of the project, Susan Aasman, described as the "art of failure" in her review of the performance:

> One of the biggest lessons was in fact a major failure. In the first scene, at a particular moment, the father failed to wind the reel in the projector. And even worse: when the film was finally in the projector, the lamp broke and we were unable to screen our home movie. Bad luck, but . . . the audience laughed. And even more surprisingly, they accepted this moment as part of the screening practice. They thought it was a moment that was scripted! That moment of laughter made us aware of the importance of people's relation with technology. And this becomes most clear at those moments when technology fails. Or better put: when people's interaction with technology becomes a struggle.[128]

Furthermore, the staging also aimed to leave behind the conventional forms of the transfer of knowledge at academic conferences (the lecture) by a theatrical staging of the topic. A "lecture-performance" was chosen to enable the audience to take part in the research process – and partake in findings through sensory perception. In her study entitled "Der Vortrag als Performance" (The lecture as performance), Sibylle Peters argues that the lecture-performance makes it possible to subvert the scientific scheme of research versus presentation and to make audiences participate in research projects by performing experiments *on-stage*.[129] In other words, the idea of the media-archaeology experiment as a medium for the generation of knowledge is combined with the situation of the performance as the actual transfer of knowledge through the lecture-performance format.

If the social dimension of historical ways of media appropriation and use are to be investigated in the case of the experiment with the different home-movie dispositifs described here, role plays (as in academic seminars) provide an opportunity to assign specific roles to actors participating in the experiment and thus have them experience how the production as well as consumption of family films frame "the home" and "the family" in equally large measure. As "formatted spaces of participation", these spatial as well as socio-cultural factors shape the habits and rituals of all participants: those in front of and those behind the camera, as well as on the projection screen or monitor.[130] The complex social interactions played out in the background of the production and

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128 Details on the project, a documentary film sequence of the experiment, and a critical review by Susan Aasman are available at: http://homemoviesproject.wordpress.com/report-staging-the-amateur-dispositif/ [last accessed 26.07.2022].

129 Sibylle Peters, *Der Vortrag als Performance* (Bielefeld: Transcript Verlag, 2011), 187.

130 Eggo Müller, "Formatted Spaces of Participation: Interactive Television and the Reshaping of the Relationship between Production and Consumption," in *Digital Material*, ed. Marianne van den Boomen et al. (Amsterdam: Amsterdam University Press, 2009), 47–61.

consumption practices nonetheless influence the "result" – in this case the family film – which Martina Roepke has designated "ensemble play".[131] Our experiment has clearly shown that the re-enactment method can make an essential contribution in becoming aware of this "ensemble play" and thus to reflect thereon as a significant experience. This post-experimental reflection on the experiences through one's own body and senses certainly changes the analytical perspective on traditional types of sources which, as argued at the start of this chapter, reflect certain types of users and user experiences each time. In this way, the media-archaeology experiment is not only the producer of a new type of knowledge inventory for the historical reconstruction of past-media practices, but it also changes the analytical perspective through its phenomenological-experience dimension.[132] Thanks to experimental education, the historian's attentiveness easily changes and with it the critical perspective on traditional types of sources: thus the historical interpretation attains a new degree of complexity.

2.8 Conclusion

Experimental media archaeology is not about the reconstruction of authentic historical experiences. Instead, it is geared to raising the awareness of participants in the experiment about

1. the functionalities ascribed to the materiality of the object (what can and cannot be done with a device);
2. its symbolic nature (design, semantics, interfaces);
3. the explication of implicit inventories of knowledge and ignorance (knowledge that provides a springboard for action);
4. the creative disconcertion of available knowledge (education through failure);
5. the reflective analysis of the performative dimension of technical objects (object as medium);
6. the tactile and the sensorial dimension of technical objects (object as art work);
7. the situation dynamics in the experimental space (between the object and the experimenter as well as between different actors).

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131 Martina Roepke, *Privat-Vorstellung: Heimkino in Deutschland vor 1945* (Hildesheim: Olms, 2006).
132 See Bernhard Waldenfels, *Phänomenologie der Aufmerksamkeit* (Frankfurt am Main: Suhrkamp Verlag, 2004).

The heuristic re-enactment method can be used to gain new insights into the temporality ascribed to communication and media-technology devices – the intriguing noises produced by old film projectors, the repulsive smell of corrupted film reels, the magic created by optical toys, the limited shooting time of 8mm amateur film reels, the short playing time of a shellac record or the long exposure times of photographic cameras, the weight of magic lanterns and lantern slides. All this is grasped altogether differently through the experimental approach to the object than through explorative readings of user's instructions or how-to manuals. Re-enactments re-sensitize experimenters to the sensorial and performative dimensions of media use and sharpen their attention to such aspects (or lack thereof) in the source material. Furthermore, re-enactments, as in makeshift laboratory spaces in the living room, for example, enhance the reflexive awareness of the spatial and topographic dimension of past-media practices – as regards both the production and consumption of contents transmitted through media technology. This practical insight in the space-time conditionality of past objects and equipment provides a better historical and critical understanding of the expressive, constructivist nature of communication and media-technology content (photographs, films, audio recordings), although the perceptual imprint of the materiality of media is mostly obscured on the level of the representation and easily escapes attention. The knowledge that provides a springboard for action generated by the experimental approach thus makes an important contribution to historical-source criticism and raises awareness among media and technology historians about the significance of the senses in the cognitive process, as well as the sensory nature of technical objects themselves.[133]

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133 A plea for a sense-sensitive historiography is offered by Mark Smith, *Sensing the Past Seeing, Hearing, Smelling, Tasting, and Touching in History* (Berkeley: University of California Press, 2007).

Chapter 3
De-Habituating Media History, Re-Sensitising Media Historians

3.1 The Idea of Newness in Media History

In their Introduction to *The Long History of New Media: Technology, Historiography, and Contextualizing Newness* (2011), David Park, Nicholas Jankowski and Steve Jones convincingly argue that the canon of media history focuses on the early periods of the histories of media, rather than the middle or late periods. There is an obvious focus on media history's "constitutive moments".[134] In a sense, media history "comes to us as a kind of pre-packaged new media history", they write.[135] It is indeed worth stepping back from this for a moment, as they suggest, to "inquire about the role that newness plays in media, and in our histories of the media".[136] There is a series of questions which comes to the fore: an epistemological question about the *over*focus of media scholars on newness; a theoretical question: "which assumptions guide them in this direction?"; and a critical, historiographical question: "where are the histories of 'middle' and 'late' periods for media?" as Park, Jankowski, and Steve Jones wonder.[137]

This last question marks a serious problem in the field of media history: there is a notable gap in media historiographical research. The question then is: *why* are the middle and late phases missing? Is this due to the fact that the history of technology has been innovation-centred rather than user-centred?[138] A well-known, second problem in historiographical research seems to surface here too: the tendency to create a *linear* if not *teleological* version of media history. In a recent editorial for *VIEW*, Andreas Fickers and Anne-Katrin Weber argue that, on the one hand, "the diachronic perspective incorporates the inherent danger of producing linear or even teleological narratives, thereby neglecting the implicit

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134 David W. Park et al., *The Long History of New Media: Technology, Historiography, and Contextualizing Newness,* 2011.

135 Park et al., *The Long History of New Media.*

136 Park et al., *The Long History of New Media.*

137 Park et al., *The Long History of New Media.*

138 See Nelly Oudshoorn and Trevor Pinch, eds., *How Users Matter. The Co-Construction of Users and Technologies* (Cambridge, MA: MIT Press, 2003); David Edgerton, "Innovation, Technology, or History: What Is the Historiography of Technology About," *Technology and Culture* 51, no. 3 (July 2010): 680–697.

openness of all historical development"; on the other hand, the "synchronic studies are confronted with the danger of over emphasising the newness of specific historical events and in messing up the potentiality of history with its actual manifestations".[139]

A third and significant problem in the field of media history is that media novelty is both *over*studied as well as *under*theorized, and that conceptual consistency with regard to the idea of media newness is lacking.[140] The question then is how to conceptualise the new, and the "once new" as Tom Gunning[141] labelled it, and how to conceptualise renewal. This question is even more pressing at this point in a time of "torrential technological change".[142] Conceptual constancy is needed to elongate and synthesise the study of (new) media history. As Benjamin Peters stresses, "a conceptual constancy in the idea of novelty" is badly needed during constant technological change, which causes "the near-instant obsolescence of studying new media". What is new one day is obsolete the next.[143]

In an attempt to reassess the idea of newness in the term "new media", Park et al. as well as the contributors to their book have sought to *historicize* and *contextualise* rather than theorise media newness. Their studies reflect on a range of older (standard) studies on newness in media history by Lisa Gitelman, Carolyn Marvin, and others.[144] These authors inspired several studies that have deepened the argument that the new and the novelty phases of media are *overvalued* in media studies and that an overfocus on newness is part of a rhetoric of the new in line with the marketing strategies of the industry, purposefully framing new devices as something revolutionary if not utopian. The "rhetoric of

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139 Andreas Fickers and Anne-Katrin Weber, "Editorial: Towards an Archaeology of Television," *VIEW Journal of European Television History and Culture* 4, no. 7 (2015), doi:10.18146/2213-0969.2015.jethc076.

140 We are referring here to the problem of conceptual constancy as discussed in Benjamin Peters' 2009 critique, to which we will return below; see Peter, "And Lead Us Not Into Thinking the New is New: A Bibliographic Case for New Media History," *New Media & Society* 11, nos. 1–2 (2009): 13–30. Media novelty has been discussed in seminal studies by Carolyn Marvin (1990) and Lisa Gitelman (2006); see note 144 below.

141 Tom Gunning, "Re-Newing Old Technologies".

142 Peters, "And Lead Us Not Into Thinking the New is New," 25.

143 Peters, "And Lead Us Not Into Thinking the New is New," 25.

144 Famous points of reference are Lisa Gitelman's 2004 study, *Always Already New: Media, History, and the Data of Culture* (Cambridge, MA: MIT Press, 2004); Carolyn Marvin's seminal study, *When Old Technologies Were New: Thinking About Electric Communication in the Late Nineteenth Century* (Oxford: Oxford University Press, 1990); Paul Grosswiler, *Old New Media. From Oral to Virtual Environments* (New York: Peter Lang, 2013); Susanne Kinnebrock, Christian Schwarzenegger, and Thomas Birkner, eds., *Theorien des Medienwandels* (Köln: Herbert von Halem, 2015).

newness" has become such a characteristic feature of media discourses that media scholars seem to have a hard time developing a critical distance from that trope.[145] The focus on newness and "revolutionary" developments has resulted in a bias in the field of Media and Communication Studies, as well as in Science and Technology Studies and the History of Technology. While processes of technological invention and innovation, as well as re-mediation, have been analysed in great detail, phenomena of hybridization, habitualisation and routinization have received much less attention.

In the conclusions to his remarkable article on the "new" in media studies, Benjamin Peters argues that it would be good to go against "the bulk of media history scholarship to treat only one period (usually the first) that a given medium appeared new".[146] He wonders what a new media history conceptualised as a "renewable media history" might look like, suggesting "that the renewable quality of media presents a richer yet significantly underdeveloped framework for understanding media in history than is widely adopted".[147] Thinking of media in terms of their renewability opens up new paths for media historians to look at media history, Peters claims: "(new) media history provides a set of lenses, such as the five stages of media renewability". Accordingly, he presents "a five-step cycle of new media evolution, from obscurity to obviousness and back again", arguing that new media can be understood as *emerging* technologies undergoing a historical process of *contestation*, *negotiation* and *institutionalisation*, and that "[t]hese terms are meant to suggest ways to think through how media arc from social obscurity to invention, innovation, obviousness and obsolescence".[148] In a similar fashion, Gabriele Balbi has proposed a 4-step model, starting with a phase of imitation (when the new copies the old); specification (when the new becomes new); reconfiguration (when the old adapts the new); and, finally, co-existence (when the old and the new live together).[149] More recently, historians of technology have paid more attention to the long histories of use, repair and maintenance of technologies and infrastructures,

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145 On the "rhetorics of newness" in media history, see Andreas Fickers, "Konservative Medienrevolutionen. Überlegungen zu einer Genealogie des Medienwandels," in *Theorien des Medienwandels*, eds. Susanne Kinnebrock et al. (Köln: Herbert von Halem, 2015), 259–279.

146 Peters, "And Lead Us Not Into Thinking the New is New," 24–25.

147 Peters, "And Lead Us Not Into Thinking the New is New," 24–25.

148 Peters, "And Lead Us Not Into Thinking the New is New," 24–25. Here one can see the "rhetoric of newness" (Fickers, 2015) at work in media scholarship.

149 Gabriele Balbi, "Old and New Media. Theorizing their Relationships in Media Historiography," in *Theorien des Medienwandels*, ed. Kinnebrock et al., 231–249.

stressing the "persistence of technology" and the many professions and skills that are involved in making technologies more sustainable.[150]

These proposals are valuable in several ways: first, as a reminder to media historians and historians of technology that – contrary to industrial and institutional rhetoric – histories of media are cyclical rather than linear;[151] second, as an attempt to refocus on such media cycles, and on the middle and last phases thereof, instead of focusing primarily, if not exclusively, on the newness phase; and finally as a pointer at the different technical, cultural, legal, economic, and social powers in play in the history of media use, powers which need to be studied in their own terms.

Instead of reproducing the evolutionary logic of linear (technical) improvement and enhancement, we aim to refocus our attention on the processes that so often fall under the radar of scholarly attention. When we become accustomed to "new things", they are interwoven into the fabric of daily life.[152] These processes need attention in media research. There are good reasons to leave an innovation-centric view behind. We sympathise with David Edgerton's plea for looking at "old" technologies in terms of their re-uses and alternative appropriations[153] by offering a specific perspective that we find to be crucial to the understanding of past media practices: that is, the sensorial, perceptual, and experiential dimensions of media use. We want to show the relevance of these dimensions of media use for an understanding of individual and collective cultural appropriation and acceptance of media technologies, and for the conceptualization of media newness and media cycles from the perspective of user experience.

In the Introduction, we already mentioned the concept of technical media (Kittler) and addressed the question of why media technologies require special attention, both in media and in technology research. We first return to the question as to why the sensorial effects created by technical media would typically be accompanied by distinct experiential effects, manifesting themselves most

150 See Andrew L. Russell, and Lee Vinsel, "After Innovation, Turn to Maintenance," *Technology and Culture* 59, no. 1 (2018): 1–25; Stefan Krebs and Heike Weber, eds., *The Persistence of Technology. Histories of Repair, Reuse and Disposal* (Bielefeld: Transcript, 2021).

151 Note that Erkki Huhtamo is focused on an analysis of the re-emerging topoi in the discourse surrounding media, pointed at the cyclical rather than linear nature of media history from a cultural and media archaeological perspective. See Huhtamo "From Kaleidoscomaniac to Cybernerd: Toward an Archeology of the Media," in *Electronic Culture: Technology and Visual Representation*, ed. Timothy Druckrey (New York: Aperture, 1996), 296–303.

152 David Nye, *Technology Matters. Questions to Live With* (Cambridge, MA: MIT Press, 2007), 65.

153 Edgerton, *The Shock of the Old*.

Fig. 13: Student tinkering with a Zeiss Ikon 35 mm projector. Photograph by Klaas Lommerse. Courtesy of the Film Archive and Media Archaeology Laboratory of the University of Groningen.

clearly in the medium's novelty phase. Next, we address the question of why these effects increase and decrease, emerge and disappear, as part of the famous *cyclical* effects noted in the history of media use. In the closing sections of this chapter, we will discuss the implications for media historiographical research. In line with our plea in Chapter 1, we take the material object and the technical properties of the device and, more specifically, the sensorial and experiential dimensions expressed in media use as a point of departure for our reflections. Why and how can they help to theoretically frame media newness?

3.2 Sensorial Dimensions in Media History

In *Gramophone, Film, Typewriter*, Kittler introduced the notion of "technical media" to discuss the specific material and technical make-up of media devices leaving specific traces in media use and needing attention when one studies their impact. There were three main sources of inspiration for Kittler that started his thinking along these lines: Michel Foucault and his archaeology of knowledge; thoughts on media as the message inspired by Marshall McLuhan, whose ideas were in turn inspired by Harrold Innis and by Heidegger's *Die Frage Der Technik*; and Rudolph Arnheim's study of early film and visual perception. Arnheim focused on the expressivity of the technical so-called *limitations* of the new cinema machine, which, as he argued, could *not* flawlessly

represent reality as so many had euphorically claimed.[154] This last argument had a direct impact on Kittler. In *Film as Art* (*Film als Kunst*, 1932), Arnheim famously discussed a crucial quality of film technologies (camera, projector, screen): technically speaking, they produce a representation of the object, which indeed resembles the object represented, yet they do so *within the limits of the technology used*.[155] This particular line of thinking became a source of inspiration to Kittler, who responded to Arnheim at several places in *Gramophone, Film, Typewriter*. In Kittler's words, "[Technical] Media and [technical] media only fulfil the 'high standards' that (according to Rudolf Arnheim) we expect from 'reproductions' since the invention of photography".[156] Thinking through the capacities of technical media used for mimetic purposes, he quotes Arnheim's words on what he calls *technical reproductions*: "'They are not only supposed to resemble the object, but rather guarantee this resemblance by being, as it were, a product of the object in question, that is, by being mechanically produced by it [. . .]'".[157] *This* quality of reproductions, made with the help of technical media, Kittler argues, implies a radical difference between "technical media" and other communication media such as language. Whereas language operates by way of a "symbolic grid", which requires that all data "pass through the bottleneck of the signifier",[158] the "technical media" process the *physical effects of the real*.[159]

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154 See Rudolf Arnheim in an interview in 2000: "My interest in film originated with an interest in the expressive capabilities of the visual. For this film offered a wealth of new examples. I was occupied with the question of how one could represent the world through a moving image, which is, however, limited by the screen. This very limitation allowed me to conclude that film can never be a simple reproduction of reality. On the contrary, filmic images have the ability to shape reality and produce meaning. Film interprets the visible world through authentic phenomena from this world and thus takes hold of experience. Film is not a direct representation in contrast to the indirectness of art; rather, it is a form of artistic expression". (Arnheim, "The Coming and Going of Images" [editorial], *Leonardo* 33, no. 3 [2000]: 167–168, http://www.leonardo.info/isast/journal/calls/arthistory_refreshcall2004.html [last accessed 26.07.2022]).
155 Rudolf Arnheim, *Film as Art* [*Film als Kunst*, 1932] (LA: University of California Press, 1957).
156 Friedrich Kittler, *Gramophone, Film, Typewriter* (Stanford, CA.: Stanford University Press, 1999), 12.
157 Kittler, *Gramophone, Film, Typewriter*, 12.
158 Kittler, *Gramophone, Film, Typewriter*, 12.
159 Geoffrey Winthrop-Young's words, cited here, are taken from the dialogue on Kittler and Arnheim in "Rethinking the Materiality of Technical Media: Friedrich Kittler, Enfant Terrible with a Rejuvenating Effect on Parental Discipline – A Dialogue" in *Technē/Technology*, 219–239. Winthrop-Young translated parts of Kittler's work, originally written in German, into

There is yet another dimension to the problem that is also of interest to us: technical media, according to Kittler, "operate against a background of noise because their data travel along physical channels; [. . .] According to Arnheim, that is the price they pay for delivering reproductions that are at the same time effects of the reproduced".[160] Now let us reconsider within the context of our project the Kittlerian dictum that "A reproduction [. . .] refers to the bodily real, which of necessity escapes all symbolic grids".[161] Another consideration is the problem that the process of production of data (to stick to Kittler's words) also produces "noise" – "blurs" and "glitches" are yet two other terms discussed in studies today[162] – which are the unsolicited by-products of the data travelling along the physical channels. Key is that engineers and other technically trained experts – e.g., expert users such as directors and camera people,[163] projectionists,[164] broadcasting teams[165] – are trained to identify noise, blurs, and glitches *as such*. However, every-day non-expert users[166] cannot necessarily do this, as reception documents indicate.[167] Furthermore, it is clear that technical teams do not only

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English, including *Gramophone, Film, Typewriter*; he also wrote highly valued introductions to Kittler's works, clarifying in passing Kittler's complex relationship with Foucault, McLuhan, Arnheim, and others (see Winthrop-Young Translator's introduction: "Friedrich Kittler and Media Discourse Analysis," in Kittler, *Gramophone, Film, Typewriter*). With ironic precision, Winthrop-Young characterises and clarifies Kittler's cryptic terminology and provocative phrasings (see Winthrop-Young, *Kittler and the Media* [Cambridge: Polity, 2011]).

160 Kittler, *Gramophone, Film, Typewriter,* 45.

161 Kittler, *Gramophone, Film, Typewriter,* 12.

162 See Kriss Ravetto-Biagioli, *Digital Uncanny* (Oxford University Press, 2019). See also Martine Beugnet, "Blur," *Acta Universitatis Sapientiae, Film and Media Studies* 17, no. 1 (2019): 9–22.

163 See Steven Willemsen's chapter "Widescreen Anamorphic Lens," in *Exposing the Film Apparatus*, eds. Giovanna Fossati and Annie van den Oever (Amsterdam: Amsterdam University Press, 2016), 109–117. See also Van den Oever, "The Aesthetics and Viewing Regimes of Cinema and Television, and Their Dialectics," in *Audiences: Defining and Researching Screen Entertainment Reception*, ed. Ian Christie (Amsterdam: Amsterdam University Press, 2012), 113–127.

164 See also Leenke Ripmeester's "The Erasure of Analog Film Projection," in *Exposing the Film Apparatus,* eds. Fossati and Van den Oever, 65–74.

165 John Ellis, "16 mm Film Editing. Using Filmed Simulation as a Hands-on Approach to TV History," *VIEW Journal of European Television History and Culture* 4, no. 7 (2015), https://vimeo.com/123212931 [last accessed 26.07.2022].

166 Non-expert users (such as everyday users of radio or TV) must not be confused with amateur users, who are mostly technical enthusiasts and fan users who enthusiastically assemble technical devices and share their knowledge on the platforms and in the networks of their interest. See Chapter 2 for a classification of users.

167 Discussions of quirky elements in the cultural reception of media are found in historical reception documents analysed in a number of studies and they prove to be an excellent source

identify the *accidental* by-products of the production process *as such*, they also propose technical amendments in line with the medium's envisioned "proper" use and strive to remove the undesired effects, as documents indicate.[168] The complicated histories of technical amendments, and more generally the dynamic unfolding of such processes of invention, testing, and amending form are thus in themselves an interesting element in the dynamic evolution of technology, as well as in the history of their use as a medium.[169] To be able to lay bare the

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for a study of the actual use of media. See, for instance, Maxim Gorky, "Last Night I was in the Kingdom of Shadows," in *The Kingdom of Shadows*, ed. Colin Harding and Simon Popple (London: Cygnus Arts, 1996), 5–11. See also discussions of Gorky's 1896 response to the Lumière's film shows in Tsivian's *Early Russian Cinema*; see also Tom Gunning, "'Animated Pictures', Tales of Cinema's Forgotten Future," in *Michigan Quarterly Review* 34, no. 4 (1995): 465–485, http://hdl.handle.net/2027/spo.act2080.0034.004:02 [last accessed 26.07.2022], and Béja Margithazi, "'Last night I was in the Kingdom of Shadows . . . ' The Role of Body and Senses in Various 'First Contact' Narratives," *Apertúra* (2012), https://www.apertura.hu/2012/osz/margi thazi-the-role-of-body-and-senses/ [last accessed 26.07.2022].

168 There are many examples found in studies, e.g., the amendments made by Leone to wide-angle lenses are discussed by David Bordwell in his *Poetics of Cinema* (New York: Routledge, 2007). Further examples can be found in John Belton, *Widescreen Cinema* (Boston: Harvard Film Studies, 1992), and Ariel Rogers, *Cinematic Appeals: The Experience of New Movie Technologies* (New York: Columbia University Press, 2013), 319–330. Annelies van Noortwijk analyses the amendments made on the single-shot system developed by documentary maker Leonard Retel Helmrich in "The Orbit and Single Shot Cinema," in *Exposing the Film Apparatus,* eds. Fossati and Van den Oever, 130–139. On sound, interesting examples are presented in Robert Spadoni, *Uncanny Bodies: The Coming of Sound Film and the Origins of the Horror Genre* (Oakland, CA: University of California Press, 2007). For TV, interesting examples can be found, for instance, in Pierre Sorlin "Television and the Close-Up," in *Cinema Futures: Cain, Abel or Cable? The Screen Arts in the Digital Age*, eds. Thomas Elsaesser and Kay Hoffmann, 119–126. (Amsterdam: Amsterdam University Press, 1998), 119–126, and Ed Tan, e.g., "The Television Screen: From Spoil-Sport to Game-Maker," in *Cinema Futures*, 223–228.

169 Interestingly, Benoît Turquety has drawn attention to Simondon's distinction between what he sees as two opposed and complementary evolution principles: "*innovation*, a minor alteration that is part of a continuous process, and *invention*, a major transformation producing a break in the technical lineage." ("On Viewfinders, Video Assist Systems, and Tape Splicers: Questioning the History of Techniques and Technology in Cinema," in *Technology and Film Scholarship Experience*, ed. Hidalgo, 242–3, doi: 10.5117/9789089647542/ch10.). Examples of an *invention* would be the so-called "birth" of the cinema, or sound cinema, or colour cinema. An example of an *innovation* would be the history of technical amendments made in the service of the continuity system established in film to create the so-called reality effect (*effet de réel*) to guarantee story flow. Note that, in terms of the history of technology, this is but one example of a line of amendments in the service of a specific practice of use of film apparatus, amongst many other forms of use, and as such it does not exemplify the teleological vector at work in film history. On the reality effect, see Roland Barthes, "L'Effet de Réel," *Communications* no. 11 (1968): 84–89. See also: Jean-Louis Baudry, "Le dispositif: approches métapsychologiques de límpression de la réalité." *Communications*

complicities of such histories in research, Richard Altman has insisted on respecting the crucial distinction between *technique* and *technology* because "[t]he important thing to remember is that a dialectical understanding of history is destroyed from the start by any theory which reduces to one those practices that interact as two".[170] As Benoît Turquety has signalled, Altman has complained about the terminological confusion created by using *technique* and *technology* as synonyms, and not keeping intact the clear distinctions between the two. According to him, "*technique* designates and should only designate ways of doing, whereas *technology* deals with the machinery, and should be strictly restricted to this area".[171] Technical objects and technical practices have their own evolutions, as Benoît Turquety wrote:

> But if technical objects and technical practices do have specific differences in their evolutions, the philosophy of technique has shown, from André Leroi-Gourhan to Gilbert Simondon, that their studies cannot be separated, for reasons that Altman himself partly suggests ("technology often automatizes an accepted technique").[172]

In other words, repetitive practices of "doing" create routines in the use of the machine in the learning phase, resulting in a skilful use of the machine, with routines which lend themselves to being built into the machine. Automatization, then, refers to technological experts building procedures ("accepted techniques") into the machine in a further process of appropriation. The evolution starts with users (often expert users) learning the technique and gaining knowledge of the use of a machine. Interestingly, the interval of "*de*-automatization" of the user –

23, no. 23 (1975): 56–72, http://www.persee.fr/web/revues/home/prescript/article/comm_0588-8018_1975_num_23_1_1348 [last accessed 26.07.2022].

170 See Rick Altman, "Toward a Theory of the History of Representational Technologies," *Iris* 2, no. 2 (1984): 115.

171 Altman, "Toward a Theory of the History of Representational Technologies," 115–116.

172 Benoît Turquety, "Toward an Archaeology of the Cinema / Technology Relation: From Mechanization to 'Digital Cinema'," in *Technē / Technology*, 52. Turquety returns to the topic in 2018, to argue that it is clarifying to make a distinction, as in the French scientific tradition, with *technology* meaning "to delineate the realm of the hardware-related, the machines, and their components, whereas technique describes what concerns gestures, practices, and the conscious choices implied on the operators' side". In addition, he argues convincingly that Simondon helps us to better understand the dynamics between *machines*, which Simondon named "technical objects", and *techniques*, which he "observed as complementary aspects of one single phenomenon, that is to be understood in its complex cohesion." Technology, then, is "the science that studies these technical objects and procedures" (Turquety, "On Viewfinders, Video Assist Systems, and Tape Splicers: Questioning the History of Techniques and Technology in Cinema," in *Technology and Film Scholarship Experience*, ed. Hidalgo, 242–3, doi: 10.5117/9789089647542/ch10).

which is typical for the early or novelty phase, and which is marked by arousal effects and a deepening of the perceptual experience (phenomena on which psychologists and modern art theory like to focus) – provides material for a history of technology (and the arts) that is remarkably different from the traditional history of technology, which focuses on objects and inventors. As abundantly shown in analyses of reception documents, every-day non-expert users absorbed in actual user practices may well ascribe all sorts of functions and meanings to machine-generated sensorial effects (scratches, blurs, glitches, noise) they do not yet know, and they do so even when such effects were never envisioned or intended by an inventor.[173] These effects nevertheless shape the user experience. Users (viewers, listeners) are known to respond particularly strongly to what they mark as "deviations" or "distortions" in the representation of the world.[174] As a perceptual psychologist, Arnheim mainly focused on the perceptual effects of what he saw as the "limitations" of the machine, the "unrealities" created by it, and their "expressive" value. Unlike Kittler, he did not focus so much on the powers unleashed by the machine itself.[175] Kittler nevertheless picked up on Arnheim's line of thinking and included Arnheim's logic into his own research agenda by focusing on "technical media" as part of his archaeology of the media. Beyond both Arnheim and Foucault, he developed a focus in research on the material and technical traces of such media technologies, which, he argued, needed to be excavated because they co-shape "the message" (McLuhan) and the "regimes" (Foucault). In Arnheimian terms, technical media create "unrealities", which have an impact on the perceptual process and shape the experience.

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173 Current-day examples are found in reflections by projectionists, such as Leenke Ripmeester, "The Erasure of Analog Film Projection," in *Exposing the Film Apparatus*, eds. Fossati and Van den Oever, 65–74. Remarkable historical examples have been excavated in an exemplary way by Yuri Tsivian in his seminal study, *Early Cinema in Russia and Its Cultural Reception*. This study has inspired research in this field ever since.

174 These strong effects of "deviations" or "distortions", in the representation of animated figures in particular, have been theorised in the field of the grotesque in terms of ontological and biological categories being fused, subverted, and distorted (either by artists or by machines), to which viewers and listeners instantly and strongly respond. The relationship with technologies has been theorised by Annie van den Oever in "The Prominence of Grotesque Figures in Visual Culture Today. Rethinking the Ontological Status of the (Moving) Image from the Perspective of the Grotesque," *Image and Text* 18 (2011): 100–123; and "The Medium-Sensitive Experience and the Paradigmatic Experience of the Grotesque, 'Unnatural' or 'Monstrous'," *Leonardo* 46, no. 1 (2013): 88–89.

175 Arnheim was primarily interested in film *as an art*, from a perceptual perspective; like Aby Warburg and E.H. Gombrich, he was keenly aware that the history of art had to take material and perceptual dimensions into consideration.

Fig. 14: Aleksander Kolkowski during a hands-on presentation of gramophone-based multi-channel recording at the Digital History Lab / University of Luxembourg, combining textual sources, photographs, original objects and replicas. Photo by Andreas Fickers. Courtesy of the C^{2}DH / University of Luxembourg.

We propose labelling the distortions created by a technical media technology-instigated distortion, as they constitute interesting aesthetic and perceptual categories in their own right.

3.3 Technology-Instigated Distortions

Technology-instigated distortions in the representation of animated figures and things are interesting to artists, art historians and philosophers of aesthetics, and no less to media historians. We assume that there is a direct connection between the technology-instigated distortions produced by novel (mimetic) media and their senso-perceptual and experiential impact on users, the so-called novelty experience. This is marked by an experience of a notable "discontinuity" in the

perceptual process, which is deepened, complicated and prolonged.[176] Such effects are particularly well-known from first-time experiences with novel media. Once media age and become part of a practice in which they are used repetitively, such effects tend to more or less disappear. Psychologists speak about arousal symptoms that habituate.[177] Here, in psychology, we find solid ground to theorize media novelty, hence, to create the *conceptual constancy* needed for the field of media studies to speak about the "new" in media history. Media newness can best be studied from the user perspective in terms of arousal symptoms in response to the use of novel (mimetic) media, which trigger new and unfamiliar technology-instigated distortions that *momentarily* affect the user experience as a result of a discontinuity in the perceptual process. They are notable as they affect the user's (first-time) experience. Media historians have access to these experiences, though in a modest way and only in so far as they are picked out by users in reception documents (the distortions in the representations may be marked as "new" or "strange", etc.; the experiences themselves as "awesome" or "amusing" or "repulsive", etc.).[178] If we know *why* novelty experiences appear (due to novel, technology-instigated distortions in the representation of people and things) and if

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176 Annie van den Oever and Ed Tan conceptualised the novelty experience in these terms in 2014, in *Settling the unsettling: medium sensitization and desensitisation cycles and the adaptation to and acceptation of novel media by viewers* (Project Proposal RUG/UvA, 2014).

177 Habituation has been defined in psychology since the 1960s. In a standard study by Thompson and Spencer, it is defined as a dissipation of a target-psychological response, i.e., psychophysiological activation at the presentation of a *novel stimulus*, due to repeated exposure only. (Richard F. Thompson and William A. Spencer, "Habituation: A Model Phenomenon for the Study of Neuronal Substrates of Behavior," *Psychological Review* 73, 1 [1966]: 16–43). Key to the novelty response then is some form of psychophysiological activation (arousal) in response to a novel stimulus.

178 Famous studies of the impact of novel media are found in the early cinema studies, e.g., Tsivian's *Early Cinema in Russia*, which can be read as a cultural excavation of the written recordings of (first contact) experiences with the early film shows, among them the 1896 exhibition of Lumière's cinematograph. The book is a treasure trove of such novelty experiences, as well as a powerful demonstration of the value of such recordings as source material for historians of culture, no less than for film and media historians. Tsivian prepared his book in the 1980s. As a pioneer in this field, he reflected on media newness in ways that are still valuable today: on first-contact experiences, their cultural context and impact, the written source material, which provides historians access to such experiences, etc. The objective newness of cinema as an invention makes Tsivian's case study of its early reception really relevant and interesting. Note, moreover, that Tom Gunning (in his texts on the "rube" show and the derogatory descriptions of Uncle Josh) has warned, from the start, that the idea of "first contact" with new media carries negative cultural connotations. The negative, colonial connotations of the "first contact" motif have also been debated extensively from an ethnographic perspective, e.g., as part of the discussion of the early documentary *Nanook of the North* (1922).

we know *how* they express themselves in the user experience (in the notably deep-ened, prolonged perceptual process), then the question is: why do they disappear?

In line with psychological studies, we assume that arousal symptoms dis-appear due to habituation; that is to say the *effects on experience* of the technol-ogy-instigated distortions of a novel medium are smoothened in the successive process of habituation.[179] Clearly, technology-instigated distortions themselves do *not* just disappear – unless the technical medium is technically amended, e.g., by technicians. However, the *effects* of these distortions *on the user experi-ence* do disappear in the process of repetitive exposure to a medium, as percep-tion becomes habitual; this is called media habituation.[180] *Repetitive exposure to the medium* – as is typical for the use of most (communication) media – cre-ates so-called habituation effects that render the medium "transparent", in the words of media scholars.[181] This is the reason the media become "second na-ture" so quickly and easily.[182]

Following early perception studies, we assume that the processes of habitua-tion and dehabituation help constitute the cycles that seem so typical for media use. In "Art as Technique", Viktor Shklovsky spoke about the mechanisms of *deha-bituation* and *habituation* respectively; these two key terms are often also translated as *de/automatization* and *de/familiarisation*. Though his discussion of these twin mechanisms misses psychological precision, we want to draw attention to these mechanisms as part of our reflections on the experiential dimensions of media use. Framing these experiences in this way – as subject to cyclical processes – helps to recognize and analyse historical references to media experiences in reception docu-ments as, for instance, typical for first-time rather than frequent media use. We as-sume that moments of so-called dehabituation are put in motion by novel media technologies at their moment of introduction; moreover, that such moments typi-cally make users sensitive to the novel technologies and, at least potentially, make them aware of the material, technical and senso-perceptual make-up of the novel medium at hand. The sensitivity to the medium exists only momentarily and van-ishes over time in the process of habituation. Van den Oever and Tan proposed calling these *Sensitization Desensitization Cycles*.[183] Accordingly, we propose not

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179 Van den Oever and Tan, *Settling the unsettling*.

180 See Thompson and Spencer, "Habituation."

181 See our reflections on (media) "transparency" as a by-product of media use in the Intro-duction to this book.

182 Gunning, "Re-Newing Old Technologies," 39–45.

183 As their title *Settling the unsettling: medium sensitization and desensitization cycles and the adaptation to and acceptance of novel media by viewers* indicates, the study of such cycles

Fig. 15: Students tinkering with a View Master and a Thaumatrope. Photograph by Julia Munuera Garcia. Courtesy of the Film Archive and Media Archaeology Laboratory of the University of Groningen.

to speak of Dehabituation Habituation Cycles but, more specifically, of Sensitization Desensitization Cycles. Additionally, we propose discussing such phenomena as *medium awareness* and *medium sensitivity*, *medium transparency* and media becoming *second nature* in terms of such Sensitization Desensitization Cycles or SDCs, that is to say, in terms of an increase or decrease in sensitivity to a medium due to rare or regular exposure to a medium respectively.

Furthermore, we assume that there is a close relationship between habituation effects and the appreciation for and adaptation of media used for communication and information purposes. The relationship (as we provisionally call it) requires further attention with the help of (media) psychology and perception studies to allow for an empirical testing of the habituation hypothesis and the precise effects on media users, perceptually, cognitively, and emotionally. However, that is not the primary focus of our attention here, which is the *re*conceptualization of media newness. In line with our argument thus far, we assume that there is an interesting relationship between the sensitization-desensitisation cycles as proposed here and

aims at understanding the processes of adaptation to and acceptance of novel media by media users in existing user practices.

the *media cycles* proposed by Benjamin Peters. We assume that media cycles are only partly institutionally driven, but also partly by user experiences shaping user practices (called "user cascades" by Djahane Salehabadi).[184] Correspondingly, we propose a further conceptualization of media newness, with the help of media psychology, to create the conceptual constancy needed to reconstruct not only the story of novelty experiences appearing and disappearing, but also the histories of "middle" and "late" periods of media, as Park, Jankowski and Jones suggested. This brings us to the topic of media researchers being *desensitised* to the material and sensorial dimensions of their objects of study.

3.4 Processes of Media Desensitisation

What are the main effects on our fields of study of media sensitization and media desensitisation respectively? Lambert Wiesing has convincingly argued that in most media theories the idea of "medial transparency" is a given.[185] When we take a closer look at the ways in which our field of study has developed in these last decades, we may wonder whether new media researchers, sensitised to the "new media" of the 1990s, have helped to create an overfocus on newness in the field, if only because novelty experiences may well spur expert users – no less than amateur users – to distinct moments of sharpened media awareness as well as experiences of *awe, wonder* and *astonishment*, to use Gunning's favourite terms.[186] Secondly, we may want to explore the perhaps more important and more lasting numbing effects of routine exposure on media research. The question is whether media researchers themselves are not *de-sensitized* to the media they do research on. Have they lost their medium awareness, by and large, just like other routine users?

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184 Djahane Salehabadi, "The Scramble for Digital Waste in Berlin," in *Cycling and Recycling. Histories of Sustainable Practices,* ed. Ruth Oldenziel and Helmuth Trischler (New York: Berghahn, 2016), 202–214.

185 Wiesing "What are Media?" 94. *Immediacy* and *hypermediacy* are two more terms suggesting transparency effects being prominent in media use; they were famously discussed by J. David Bolter and Richard A. Grusin in their reflections on what they call *remediation* in the somewhat surprising terms of a *desire* for transparency. "In formal terms, the desire for immediacy is the desire to get beyond the medium to the objects of representation themselves. Different media may enact this desire in different ways" (Bolter and Grusin, *Remediation: Understanding New Media* [Cambridge, MA: MIT Press, 1999], 83).

186 Tom Gunning, "An Aesthetic of Astonishment: Early Film and the Incredulous Spectator," in *Viewing Positions: Ways of Seeing Film*, ed. Linda Williams (New Brunswick, NJ: Rutgers University Press, 1995), 114–133.

Being *desensitised* to a medium normally means that the sensitivity to the medium has vanished as the initial experiential effects wear off due to habituation. This would inevitably lead to a decrease in sensitivity to the distorting powers of the technology, to the point of users becoming almost fully unaware of them. It may almost automatically lead to a point where the material presence of technologies in the mediating is no longer noticed during the shortened perceptual process; a quick and swift shift in focus from the medium to the mediated becomes not only habitual, but even "natural" or "second nature". Being perceived as natural indicates that once the mechanism of habituation facilitates such a smooth shift in the perceptual process from perceptual input to cognition, fully automatic and unnoticed by the percipients, these users of media may altogether stop noticing the ontological difference between, say, *a pipe* in reality and one on a photo, TV, laptop, smartphone, cinema screen or canvas. This easily leads to a merger of the represented and the "real thing". As the famous Magritte painting suggests, even experts need to be reminded that *Ceci n'est pas une pipe*. This is not a pipe. This is a representation of a pipe. This is a painting. The radical irony, of course, also includes the connotation of Magritte's pipe being overtly phallic.

In general, medium *unawareness* is a predictable and almost inevitable effect of media habituation. Once media technologies have become second nature, even media scholars easily lose sight of them. As a result, the special ontological status of the image as "mediated" is easily overlooked and the technical make-up of the medium may simply go unquestioned – by media scholars too. In other words, media research does not necessarily benefit from the Sensitization Desensitisation Cycles: long intervals of medium *desensitisation* may straightforwardly facilitate a dominant research focus on the "real", that is, an overlooking of the medium itself once habituation has kicked in. This may be referred to as the *realist fallacy* in media-historical research: desensitised to its effects, realists basically leave the medium itself understudied. Therefore, we must conclude that overlooking the medium is not an accidental, but a fundamental and structural phenomenon, also in the field of media research, and that habituation is the mechanism underlying the phenomenon.[187]

3.5 The Re-Sensitisation of Researchers

Where does this leave media historians and their attempts to write the histories of media (technologies)? We assume that *doing* hands-on experiments with media

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187 Van den Oever, "The Medium-Sensitive Experience," 88–89.

technologies, in lab situations, for example, helps to reverse the processes of habituation and desensitisation. Such experiments help to *re-sensitize* researchers to the effects of media technologies. Experimental media archaeology, hands-on, can make historians (at least potentially) aware of the material, technical and senso-perceptual make-up of old and obsolete media technologies and so-called "dead" or "zombie" media.[188] As part of a cultural archaeology of (media) technology, such an enterprise seems relevant if not inevitable. As early cinema historian, Tom Gunning, argues in "Re-Newing Old Technologies", new technologies enter culture(s) charged with a utopian envisioning of a future they imagine to be "radically transformed by the implications of the device or practice". However, he also concludes that the sinking of technology into "a reified second nature" indicates the failure, by and large, of the transformations envisioned; new media end up fitting into, rather than changing, the already existing "grooves of power and exploitation". As Gunning states, we need an archaeology of technology to grasp again the (lost) *newness of old technologies*.[189]

On the basis of our own lab experiences with colleagues and students, we assume that in general researchers can be made much more medium aware and medium sensitive, not only to the old and dead media collected in archives, but also to the traces of user experiences left in historical reception documents. Among them are cues marking distinct historical user experiences of media newness – signs of awe, wonder, and astonishment, but incidentally also comic amusement, repulsion, horror and a sense of uncanniness.[190] Particularly awe, wonder, and astonishment provide an ideal upbeat background to the utopian envisioning in which the launch of novel media can take place. In line with "Re-Newing Old Technologies", we would like to underline the relevance of "reversing the cycle of wonder" for researchers. We plead for a re-sensitization of media researchers, one which seeks to make them more sensitive to the material, technical, experiential and senso-perceptual dimensions of media use, as well as to the traces of media experiences in the source material. Moreover, re-sensitization and an intensified medium awareness may help researchers to frame new questions concerning novelty experiences and their – mostly sudden – appearance and gradual disappearance in the ebb and flood of media's (de)habituation histories.[191]

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188 See Garnet D. Hertz and Parikka Jussi, "Zombie Media: Circuit Bending Media Archaeology into an Art," *Leonardo* 45, no. 5 (2012): 424–430.
189 Gunning, "Re-Newing Old Technologies," 56–57.
190 See Tsivian, *Early Cinema in Russia*, and Gunning "Re-Newing Old Technologies."
191 There are signals that not all the novelty / arousal symptoms (fully) disappear due to habituation. For example, a question is whether the instant and strong arousal effects disappear due to habituation when they are as strong as the effects famously triggered by the gigantic

3.6 Hands-On Experiments and Re-Enactments as a Research and Teaching Method

One possible way of exploring past media practices is to do re-enactments or hands-on experiments with old media devices, as we have been envisioning since 2013. At the heart of it is our plea to open the vaults and glass cases of museums: to make the device collections available to researchers for experiments, *hands-on*. A second goal of experimental media archaeology is to sensitise researchers to the sensorial and experiential dimension of media use. A third goal is to reach beyond sensitization effects and to "grasp" media and communication

Fig. 16: Speakers, historical advisers, and the production crew of the radio play "Glory and Misery of Dummy-head recording" at studio 3 of the Bayerische Rundfunk (BR) in December 2016. Photo by Stefan Krebs. Courtesy of the C[2]DH / University of Luxembourg.

IMAX screens, which are purposefully positioned above the seated cinema audience that is made to look up at them. The impact of these screens on experience is clearly designed by IMAX technicians to not fully disappear; nevertheless, these effects seem to be diminishing gradually, and marginal touch-ups of the screen size and screen position seem needed to prolong the effect on the spectator desired by IMAX. This is just one among many examples where further research would be needed to substantiate the effects on experience increasing and decreasing due to novelty and habituation respectively.

technologies in their concrete materiality and tangibility, a hermeneutical act in Cassirer's sense, involving the intellectual process of comprehending, as well as the sensory-bodily appropriation of getting a grip on things.[192]

In line with Cassirer and others, we want to argue that *doing* media archaeological experiments in this experimental system of knowledge production turns historians (if only momentarily) into experimenters who experience the "mangle of practice",[193] of "science in action".[194] From this experimental practice flows a series of advantages marked by researchers under a range of different labels: "collaborative thinking";[195] "thinkering";[196] "heuristic groping";[197] or "bricolage";[198] taking place in a "living laboratory",[199] a context which fosters a process of "situated learning"[200] and "learning by doing".[201] Moreover, the careful documentation and self-reflexive analysis of such an experimental practice will be greatly beneficial for the fields of media archaeology, media history, and material and museum studies.[202]

We wish to emphasise once again that doing experiments with past media technologies – be it with originals or replicas – produces authentic contemporary experiences, but these (lab) experiences can, in no way, recreate "authentic" historical experiences. As one of the pioneers of sensory history, Mark Smith, has convincingly argued, we need to carefully distinguish between sensory production and consumption.[203] While it is possible to reproduce a particular sound or image

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[192] Ernst Cassirer, "Form und Technik," 39–89.

[193] Andrew Pickering, *The Mangle of Practice: Time, Agency, and Science* (Chicago: University of Chicago Press, 1995).

[194] Bruno Latour and Steve Woolgar, *Laboratory Life: The Construction of Scientific Facts* (Princeton NJ: Princeton University Press, 1979).

[195] Kevin Corrigan, "Collaborative Thinking: The Challenge of the Modern University," *Arts & Humanities in Higher Education* 11, no. 3 (2012): 262–272.

[196] Erkki Huhtamo, *Illusions in Motion*.

[197] Breidbach et al., *Experimentelle Wissenschaftsgeschichte*, 13–72.

[198] Hans Jörg Rheinberger, *Die Farben des Tastens. Hans-Jörg Rheinberger im Gespräch mit Alexandru Bulucz* (Frankfurt am Main: Edition Faust, 2015).

[199] Gabriella Arrigoni, "Innovation, Collaboration, Education: Histories and Perspectives on Living Labs," In *xCoAx2013*: *Proceedings of the First Conference on Computation Communication Aesthetics and X, Bergamo, 2013* (Porto: Universidade do Porto, 2013), 215–224.

[200] Jean Lave and Etienne Wenger, *Situated Learning: Legitimate Peripheral Participation* (Cambridge: Cambridge University Press, 1991).

[201] Peter Heering and Roland Wittje, eds., *Learning by Doing. Experiments and Instruments in the History of Science Teaching* (Stuttgart: Franz Steiner Verlag, 2011).

[202] Ludwig & Weber, 2013; Byrne et al., 2011; Mihaly Csikszentmihalyi, "Why We Need Things," in *History From Things: Essays on Material Culture*, eds. Steven Lubar and W. David Kingery (Washington, London: Smithsonian Institution Press, 1993), 20–29.

[203] Mark Smith, "Producing sense, consuming sense, making sense: perils and prospects for sensory history." *Journal of Social Sciences* 40, no. 4 (2007): 841–858.

of the past by using original hardware and software, the way we understand, experience and "consume" these sounds and images is radically different from the way in which people interpreted these in the past,[204] and, by extension, in different geographical and cultural contexts, or from non-typical bodies. "Failure to distinguish between sensory production (something that can, at least theoretically, be replicated in the present) and sensory consumption (something that is hostage to the context in which it was produced) betrays the promise of sensory history", as Smith argued.[205]

Although authenticity is "a currency and competency standard within the re-enactor's history work", as Stephen Gapps has put it, the re-enactors/experimenters are charmed *not* by the original, but by its authentic simulation.[206] It is the combination of old and new, the playful practice of locating, embodying, and recalling that make re-enactments or media archaeological experiments an authentic mode of communicative memory practices;[207] or, to quote Tilmans, Van Vree and Winter:

> Re-enactment is both affirmation and renewal. It entails addressing the old, but it also engenders something new, something we have never seen before. Herein lies the excitement of performance, as well as its surprises and its distortions.[208]

Re-enactments and experimental approaches open up possibilities that allow history to be understood as unfinished business.[209] Appreciation for the affirmative qualities of experimentation also resonate in Simone Venturini's work, where he speaks of it as "the human and corporal reclaiming of the technology".[210] Such "aesthetic experimentations" with media devices are described by Emilio Garroni as "practical operations on the technology and material of a reflective nature". Interestingly, in his 1977 book *Ricognizione della semiotica*, Garroni had already typified such practical operations as *mainly meta-operational activities*.[211]

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204 Smith, "Producing sense," 841. As to "consume", a key term in Smith's reflections, see his title: "Producing sense, *consuming sense*, making sense: perils and prospects for sensory history" (our italics).

205 Smith, "Producing sense," 841.

206 Stephen Gapps, "Mobile Monuments: A view of historical re-enactment and authenticity from inside the costume cupboard of history," *Rethinking History* 13, no. 3 (2009): 398.

207 Anja Dreschke et al., eds. *Reenactments: Medienpraktiken zwischen Wiederholung und kreativer Aneignung* (Bielefeld: Transcript Verlag, 2016).

208 Karin Tilmans et al., eds. *Performing the Past. Memory, History, and Identity in Modern Europe* (Amsterdam: Amsterdam University Press, 2010), 7.

209 Gapps, "Mobile Monuments," 207.

210 Simone Venturini, "Technological Platforms," 201–202.

211 Emilio Garroni, *Ricognizione della Semiotica* (1977); quoted by Simone Venturini, "Technological Platforms," 202.

While the heuristic potential of experimental media archaeology has been outlined in detail in the preceding chapters, the question of how to document and "translate" the sensorial experiences and perceptions made during such hands-on interactions with past media technologies remains largely unexplored. Within the field of "sensory studies",[212] anthropological and ethnographic approaches have been most explicit in documenting processes of embodiment and the plurality of sensory modes of engagement. Most prominently, Sarah Pink has advocated a "sensory ethnography" that experiments with multiple media for the registration and communication of cultural facts and practices.[213] As a reflexive and experiential process through which understanding, knowing and (academic) knowledge are produced, research on sensory perception and reception requires methods that are capable of grasping "the most profound type of knowledge [which] is not spoken of at all and thus inaccessible to ethnographic observation or interview", as Pink argues.[214]

By using audio-visual media to document non-verbal communication, behaviour and emotional reactions of users interacting with media technologies, we can try to open up for research, and help make explicit the embodied and implicit forms of knowledge invested in past media usages. Sound and video recordings can work as analytical instruments to document the tacit knowledge of our hands, bodies, eyes, and ears when operating media devices. Such recordings help us to grasp the complex and subtle human-machine relations as social interactions in situations of media consumption or use. In the exposure to the aesthetic and performative quality of media technologies, we aim to re-sensitize experimental historians to their own "embodiedness" and to enhance their awareness of the limitations of speech and written language as primary modes of knowledge production.[215] Capturing and documenting these embodied forms of implicit or tacit knowledge enables researchers to make explicit what the experimental historian of science Otto Sibum has described as "gestisches Wissen" – *skilled knowledge.*[216]

212 David Howes, "The Expanding Field of Sensory Studies," (Version 1.0- August 2013), https://sensorystudies.org [last accessed 26.07.2022].

213 Sarah Pink, *Doing Sensory Ethnography* (London: Sage, 2009).

214 Pink, *Doing Sensory Ethnography*, 4.

215 Serres, *The Five Senses*. See our reflections on Serres' critique in Chapter 1.

216 Heinz O. Sibum, "Die Sprache der Instrumente. Eine Studie zur Praxis und Repräsentation des Experimentierens," in M. Heidelberger and F. Steinle, eds., *Experimental Essays – Versuche zum Experiment* (Baden-Baden: Nomos, 1998), 154.

Reflecting on his hands-on simulations of 16-mm film editing, John Ellis emphasised the limits of using linguistic/textual representations as the most adequate technique for describing implicit forms of expertise or technical skills:

> Verbal analysis can go some way to explicating the details, but in the end this is hands-on history where information has to be experienced as well as written . . . or, at least, has to be read audiovisually.[217]

But what will such audio-visual representations tell us about the experiences of the experimenters/re-enactors? Will they enable us to get closer to their sensorial perceptions, emotions or performative pleasures when interacting with past (perhaps replicated) media technologies? Or to their *fatigue* (it was work, after all)? Or to the pain created by the long-term use of heavy equipment? Hardly so. Sure, a trained video or sound analyst (or experienced "sensory ethnographer") might be able to detect specific gestures or emotional reactions to map the spatial setting and situatedness of the human-machine interactions, as well as the social interactions during the hands-on experiments, which can help to qualify a re-enactment as contemporary historical performance. However, in terms of interpretative evidence, such documentation remains somewhat speculative. Important, it seems to us, is the added heuristic and meta-reflective value of doing hands-on experiments (and additionally documenting them audio-visually). The value is in the deconstruction of the myth of the authentic historical experience. Furthermore, the inherent contradiction of any such endeavour is turned into a purposefully *distortive* intellectual experience full of creative uncertainty.

3.7 Conclusion

Technology-instigated distortions in the representation of figures and things are constitutive to novelty experiences, that is, to the idea of newness as an experiential category in the field of media. The material and senso-perceptual dimensions of the medium play a role in the arousal process, that is, in the arousal symptoms increasing in a novelty experience, and decreasing in repetitive use, due to habituation. Novelty experiences are formative to some of the experiments we designed in the field of experimental media archaeology. This is to say that, instead of reproducing canonical master narratives of moments of "media newness"

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217 John Ellis, "16 mm Film Editing. Using Filmed Simulation as a Hands-on Approach to TV History," *VIEW Journal of European Television History and Culture* 4, no. 7 (2015), https://vimeo.com/123212931 [last accessed 26.07.2022].

based on discourse analysis of textual, sonic or visual representations of the past, the hands-on experiments we propose with old media devices or replicas aim, first of all, at re-sensitizing researchers and at the human and corporal reclaiming of technology. Re-sensitization experiments aim at regaining a keen, corporal sensitivity to the senso-perceptual, tacit and experiential dimensions present in hands-on practices with media devices, a sensitivity which researchers predictably will have lost in their routine use of media technologies. Secondly, we aim to nurture a heuristic and meta-reflective attitude towards user practices – including an awareness of the fact that *making things work* (as they should) is most likely to be an experience of failure, breakdown, and disappointment rather than one of immersion, habituation and routinized pleasure. While the appropriation and use of the media technologies and especially the consumer electronics that have invaded our domestic and public spaces since the 1960s has been *negatively* characterised by some as an "inflation of things",[218] the *positive* experience of some new media practices in the mechanical and electromechanical era is the exposure to extensive intervals of tinkering, learning and, most importantly, repairing and maintaining.[219] In other words, habituation and routine used as the dominant modes of media consumption are the result of a "ready to use" consumption habit, which is closely tied to a "ready to throw-away" culture in the case of dysfunction.[220] As opposed to this, the exposure of users to ever-new media invites de-habituation effects and a re-sensitization to (modes of) media use much appreciated by (new) media researchers.

Building replicas, taking precious devices from their glass cases, and experimenting with originals, we argue, will help to dehabituate media historians from their fixation on media newness and authenticity. It might produce creative distortions in a field dominated by canonical narratives of technological inventions and innovations, and refocus on cascades of media use (rather than technical newness). And, lastly, it might dehabituate historians from the standard media histories and value the surprisingly capricious and quirky (de)habituation histories so typical of the experiences of past media practices.

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218 "Dinginflation" is the German term coined by Martina Heßler, *Kulturgeschichte der Technik* (Frankfurt: Campus Verlag, 2012), to mark the sense of "inflation" accompanying the electronics emerging in the personal lives of people (relabelled as *consumers*) in the post-sixties era.

219 Stefan Krebs et al., "Kulturen des Reparierens und die Lebensdauer der Dinge," in *Kulturen des Reparierens*, ed. Stefan Krebs et al. (Bielefeld: Transcript Verlag, 2018), 9–46.

220 We take these notions – "ready to use" / "ready to throw-away" – from the discussion by Krebs, Schabacher and Weber, "Kulturen des Reparierens" (Bielefeld: Transcript Verlag, 2018).

Chapter 4
Methods, Procedures, Protocols, or:
How to Make the Implicit Explicit

4.1 Introduction

In the previous chapters, we outlined the theoretical framework of experimental media archaeology and argued that doing this kind of hands-on media history has the potential to offer a fresh look at past media technologies and objects in action. Based on the user-typology outlined in our "Plea for new directions",[221] we assume that experimental media archaeology adds a new interpretative layer in the complex historical study of past media practices. This book tries to enlarge the methodological toolkit of classical media history and archaeology by an experimental hands-on approach that challenges traditional forms of historical research on media. While the heuristic potential and epistemological gains have been described in detail, this chapter discusses the practical challenges of doing experimental media archaeology in various settings and aims at reflecting on the role of the historian-experimenter as active co-constructor of the "epistemic thing" he or she aims to study. In other words, it aims at looking more closely at "science in action" (Latour),[222] and at the process of knowledge construction that is unfolding while doing experiments in media archaeology.

Describing this iterative and – from an epistemological or hermeneutic perspective by definition "open" process – requires a critical reflection on experimental settings, practices, and findings. In order to do this, we propose using phenomenological and ethnographic concepts and methods of self-reflection and documentation. As the doing of experimental media archaeology involves both our minds and bodies, we need to think about how to make explicit the implicit mingling of our bodies in the production of new historical knowledge. The importance of so-called "tacit" (Polanyi),[223] "embodied" (Merleau-Ponty),[224] "gestural" (Sibum)[225] knowledge and "thinking with our hands"

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221 First developed in Andreas Fickers, "Hands-on. Plädoyer für eine experimentelle Medienarchäologie," *Technikgeschichte* 82, no. 1 (2015): 67–85.
222 Bruno Latour, *Science in Action. How to Follow Scientists and Engineers through Society* (Cambridge, MA: Harvard University Press, 1987).
223 Michael Polanyi, *The Tacit Dimension* (London: Routledge, 1967).
224 Maurice Merleau-Ponty, *Phenomenology of Perception* (London: Routledge, 1962).
225 Otto Sibum, "Science and the Knowing Body. Making Sense of Embodied Knowledge in Scientific Experiment," in *Reconstruction, Replication and Re-enactment in the Humanities and*

(Rheinberger)[226] in both the sciences and the social sciences and humanities has been widely recognized, but how to make this "knowing from the inside" (Ingold)[227] explicit, thereby turning it into a constitutive element of our methodological reflection of doing hands-on history, is far from obvious and has been given little attention in historical scholarship so far.

4.2 Experimental Settings and Types of Experimentation in Media Archaeology

Before tackling the delicate problem of translating and interpreting the experiences of doing experimental media archaeology in an auto-ethnographic or self-descriptive and analytical way, we need to reflect upon the specific settings in which hands-on media histories can be practised. As we know from the work of historian of science Hans-Jörg Rheinberger, experimental systems – and we would frame our hands-on history activities in experimental media archaeology as such a system – are embedded into specific "experimental cultures", reflecting specific "styles of scientific thinking" and communities of practice.[228] Using the example of "in vitro" experimental culture in early twentieth-century biochemistry, Rheinberger stresses the importance of studying scientific practices in micro-historical perspective, aiming to show the importance of local "epistemic milieus" and the social constitution of the knowledge production process. In line with so-called "laboratory studies" in science and technology studies,[229] we argue that doing experiments in the field of media archaeology requires a

Social Sciences, ed. Sven Dupré et al. (Amsterdam: Amsterdam University Press, 2020), 275–293.

226 Hans-Jörg Rheinberger, "Mit den Händen denken. Im Gespräch mit Heiko Roehl," in *Experimentalität: Hans-Jörg Rheinberger im Gespräch über Labor, Atelier und Archiv* (Berlin: Kadmos, 2018), 228–236.

227 Tim Ingold, *Making. Anthropology, Archaeology, Art and Architecture* (London: Routledge, 2013), 1–15.

228 Hans-Jörg Rheinberger, *Spalt und Fuge. Eine Phänomenologie des Experiments* (Frankfurt am Main: Suhrkamp, 2021). See particularly chapter 7: "Experimentalkulturen," 164–189.

229 Canonical works in this domain of sociology of knowledge are Bruno Latour and Steve Woolgar, *Laboratory Life: The Construction of Scientific Facts* (Princeton, NJ: Princeton University Press, 1986); Karin Knorr-Cetina, *The Manufacture of Knowledge: An Essay in the Constructivist and Contextual Nature of Science* (Oxford: Pergamon Press, 1981). For a general introduction see Karin Knorr-Cetina, "Laboratory Studies: The Cultural Approach to the Study of Science," in *Handbook of Science and Technology Studies,* ed. Sheila Jasanoff et al. (Thousand Oaks, CA: Sage Publications, 1995), 140–66.

careful reflection about the locality and social framing in which hands-on history is practised.

Based on their experiences gathered in the research project "Doing Experimental Media Archaeology: Practice & Theory",[230] Tim van der Heijden and Aleksander Kolkowski propose differentiating between three types of experiments in the field of media archaeology, each with a different purpose and reflecting a specific "mode" of experimentation (▸ Practice, Introduction). The first category is called "basic experiments":

> Basic experiments study the media historical objects as epistemic objects. They focus on the technical functions and usability of the object, measure its performative capabilities and indicate the need for repair, restoration and maintenance, as well as the physical conditions under which they can operate. By measuring luminosity, loudness and dynamic range, for example, they examine the technical conditions of surviving artefacts and the physical conditions under which they can or must operate (e.g., the brightness/darkness or noisiness/calmness of the environment). They will also identify restrictions for experiments, such as safety, conservation, missing parts, and test suitable substitutes for lost or unusable components.[231]

Next to these basic experiments, they introduce the category of "media-technological experiments":

> Media-technological experiments focus on the object affordances and the object-user interaction. They allow for an exploratory examination of the objects and the tacit or embodied knowledge required to operate them. As such, they study the user-friendliness and the aesthetic qualities produced by surviving media-technological artefacts and their replicas, for instance, experiments with historical projection and sound reproduction apparatuses. Failures and unexpected problems are an important part of media-technological experiments as they can produce "creative uncertainties" that are at the heart of "thinkering" as an experimental mode of knowledge production.[232]

A third and last category of experiments is so-called "performative experiments":

> Performative experiments are an examination of historical media performances through reenactments, public presentations and demonstrations. Here the focus is on the interaction between the object, user, location and a modern audience or participants. The performance or live action, in its entirety, becomes the epistemic object under scrutiny.[233]

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230 See "Doing Experimental Media Archaeology", DEMA research project (Luxembourg: University of Luxembourg, 2019–2022), https://dema.uni.lu [last accessed 26.07.2022].

231 Van der Heijden and Kolkowski, *Doing Experimental Media Archaeology: Practice*, Introduction.

232 Van der Heijden and Kolkowski, *Doing Experimental Media Archaeology: Practice*, Introduction.

233 Van der Heijden and Kolkowski, *Doing Experimental Media Archaeology: Practice*, Introduction.

This differentiation between basic, media-technological, and performative experiments is crucial when it comes to the setting in which such experiments can or should be conducted. While a classical experiment in the sciences usually takes place within a laboratory setting, that is a controlled environment equipped with normed or calibrated instruments of measurement and standardised protocols, experiments in media archaeology can happen in a much greater variety of settings. While basic experiments – for example, testing the brightness of different light sources (candles, oil, gas, electric bulbs) for a specific type of Laterna Magica – do require a specific environment respecting safety and/or noise protection measures, performative experiments – such as the live re-enactment of a film projection with a Pathé Baby projector or an open-air concert with a pneumatically amplified gramophone – ask for a careful mise-en-scène of a 1920s living room, and the orchestration of a public space (e.g., the use of a rotunda in a park) respectively. When embedded in an educational setting – a good example would be the use of the film archive collection at Groningen University – or when embedded in a combined educational and entertaining setting – one can think of the museums that offer hands-on experiments with old media objects (for instance, the Media Museum in Bradford, *Deutsches Filmmuseum* in Frankfurt, *Eye Filmmuseum* in Amsterdam, or the *Fondation Jérôme Seydoux-Pathé* in Paris) – the experimental setting will largely be framed by institutional and legal contexts.

Most of the time, the experimental system of EMA will thus not be comparable to the controlled environment of a laboratory setting in the sciences, but framed by local affordances of either "in situ" or "in vivo" settings. Depending on these contexts, the "modes" of experimentation that are performed may vary accordingly. Van der Heijden and Kolkowski distinguish five modes of experimentation in EMA (▸ Practice, Chapter 1.2.1):[234]

– **Thinkering**: a playful exploration that focuses on materiality and recreating the experience of past media. The goal of experimenting in this mode is *exploratory*. The media historical object is explored as a historical source in its own right by investigating its unique material characteristics, qualities/

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234 The different "modes" were discussed during the second workshop of the DEMA-project "Performing Media Archaeological Experiments" in December 2020. The workshop aimed at offering a broad view on different hands-on methodologies in the field of history, including experimental archaeology, art history, musicology, sensorial ethnography, history of science and medicine, media history, and art. See a report on the workshop, including video demonstrations of various experiments: https://dema.uni.lu/performing-media-archaeological-experiments-report/ [last accessed 26.07.2022].

affordances and functionality. The method of "thinkering" also includes the creative reuse of past media technologies.

– **Simulation**: a systematic reconstruction that focuses on simulating the user-object relationship and the retrieval of tacit knowledge involved. The aim of experimentation is principally *demonstrative*: the functioning of the media historical object and its use are demonstrated through their physical and/or digital simulations.

– **Re-enactment**: where there are no surviving practitioners taking part, a re-enactment attempts, as far as possible, to recreate historical practices, and examines the workings and outcomes of the technological object in action. Unlike the methods of thinkering or simulation, the nature of re-enactment is *performative*: the media historical object and its usage are staged for and in front of an audience.

– **Replication**: where an historical object may not be used or is unavailable, it can be substituted with a replica. As a research method, the construction of a replica provides insights into the resilience of the epistemic object under scrutiny. The modus of experimentation is *educational*, emphasising the role of failure, resistance and learning by doing.

– **Artistic**: in the creative or artistic modus, the objects, technologies or practices are "reimagined" or an existing media technology "re-purposed" for creative or originally unintended usages. This approach allows modern audiences, researchers and practitioners to experience the media technologies in new and unexpected ways. The modus is characterised by *creative distortion* and/or *sensorial affection*.

Before planning and doing an experiment in media archaeology, it is therefore important to think carefully about the envisioned mode or epistemological ambition of the hands-on history activity. We have sufficient evidence from a variety of hands-on approaches in history[235] that this specific practice of doing history is likely to change our relationship with the past – both intellectually and sensorially. Reflecting on the experimental setting and purpose of any experiment engaging with past media objects, technologies, or practices, before getting our minds and bodies to connect with past remains, is therefore a methodological necessity.

Experimentation as a historical research method not only "defamiliarizes our relationship with technologies",[236] as John Ellis and Nick Hall have argued, but

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235 See Nick Hall and John Ellis, eds. *Hands On Media History. A New Methodology in the Humanities and Social Sciences* (London: Routledge, 2020); Sven Dupré et al., eds. *Reconstruction, Replication and Re-enactment*.

236 Hall and Ellis, *Hands On Media History*, 2.

has a direct impact on how we imagine the past to have looked, sounded, smelled, or tasted. Engaging with the past beyond the study of written documents or archival records – as important and inevitable as such sources are for the study of history – will probably have a greater impact on ourselves as research subjects than offering radically new interpretations of the past. As a "mediator between the object and the subject",[237] the experiment has the heuristic potential of changing our historical imagination and how we experience historical research as an imaginative encounter with what is by definition beyond our reach – the past.

Fig. 17: Online-support (via Skype) by Aleksander Kolkowski during a hands-on experimentation with an Edison gramophone by Stefan Krebs. Photo by Andreas Fickers. Courtesy of the C²DH / University of Luxembourg.

Despite the preparatory thinking that goes into the conception and planning of an experiment, the experimental process is open and characterised by "heuristic groping", failures, and the production of fragmentary pieces of evidence. The "translation" of the uncertain and dynamic findings produced and documented during the

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237 Johann Wolfgang Goethe, "Der Versuch als Vermittler von Objekt und Subjekt," in *Gedenkausgabe der Werke, Briefe und Gespräche,* vol. 16 (Zürich: Ernst Beutler, 1949), 844–855. First published in 1792.

experimental process into scientific fact, theory, or evidence-based interpretation always happens "ex post" in a process of "interpretative closure"[238] and rationalisation. Hence it is of even greater importance that we document this iterative journey in order to make our findings comprehensible, retraceable and transparent. The semantics of the older German term for experiment – *der Versuch* – refer in the most obvious way to the meaning of experimentation as a search (*die Suche*) – a contingent and open-ended process, a "wandering" in the Serresian sense. Following Michel Serres, "*randonneur*" would possibly be the best metaphor for qualifying the mental state of the experimenter: "Strike out sideways" – "*débrouillez-vous*" – is Serres' credo in the chapter "Method and Wandering" in *The Five Senses. A Philosophy of Mingled Bodies.*[239] Indeed, doing experimental media archaeology can feel like the exodus of Ulysses described by Serres, that journey characterised by deviations, fluctuations and dispersions rather than Cartesian linearity. The semantics of the term *randonnée*, originating from the French *courir à randon* – which means to hunt for game and the reading of tracks, but in English as "random" retains the memory of the irregular, unforeseen escape route of the game and thus refers to the randomness of the route covered – expresses precisely the feeling of ambivalence and uncertainty that resonates in the experimenter's mind when trying to "grasp" the meaning(s) of practising hands-on history.

So how can we "capture" such "hermeneutics of screwing around"?[240] In order to make this happen, the experimental system has to meet the *Aufschreibesystem* – this is where the logics of experimentation and the logics of documentation interfere and condition one another.

4.3 Experimental System meets *Aufschreibesystem*

"The empirical reasoning is clear only afterwards, when the explanatory apparatus has come to the course. The temporal structure of cognition is thus that of a past future".[241] Building on the epistemological theory of Gaston Bachelard,

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238 Trevor J. Pinch and Wiebe E. Bijker, "The Social Construction of Facts and Artefacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other," *Social Studies of Science* 14, no. 3 (1984): 399–441.

239 Serres, *The Five Senses*.

240 Stephen Ramsey, "The Hermeneutics of Screwing Around; or What You Do with a Million Books," in *Pastplay. Teaching and Learning History with Technology*, ed. Kevin Kee (Michigan: University of Michigan Press, 2014), 111–120.

241 Rheinberger, *Spalt und Fuge*, 232, referring to Gaston Bachelard, *Die Bildung des wissenschaftlichen Geistes. Beitrag zu einer Psychoanalyse der objektiven Erkenntnis* (Frankfurt am Main: Suhrkamp 1978), 46.

Hans-Jörg Rheinberger has recently published a phenomenological study of the scientific experiment, in which he offers a detailed description of the "experimental substructure" (*experimenteller Unterbau*) of experimental systems, with particular attention for the materiality and practices of knowledge production. While the second part of the book concentrates on the "space of experiment" described as "*Supra-Experimentalität*" and focuses on the spatial and temporal conditions of experimental cultures, the first part of the book entitled "*Infra-Experimentalität*" aims at offering thick descriptions of experimental practices and the production of epistemic objects in a micro-historical approach. In the fifth chapter of this first part, Rheinberger pays special attention to technologies of documentation, which he subsumes under the term "protocols".[242]

This fifth chapter is of specific interest to us as it analyses the laboratory as a *Schreibfläche* and *Darstellungsraum* – a space of inscription and representation in which the traces of experimental activities are turned into a patchwork of indices, icons, and symbols. Protocols – under which Rheinberger subsumes laboratory notes, graphs, lists, logfiles, or diaries – are "*literale Experimentaltechniken*" (literary techniques of experimentation) and, as such, constitutive elements of a "discursive materiality" of the experimental system:

> Die Umwandlung des Labors in eine Schreibfläche, die Umwandlung des Erinnerungsraums von einer bloßen Chronologie in ein Zechen-Flickwerk aus Indizes, Ikonen und Symbolen hat dementsprechend mehr als nur verknappende und aufweitende Funktion. Labornotizen und Laborprotokolle bringen im Gegenteil neue Ressourcen und Materialien hervor, die der Forschung erst ihre charakteristischen Konturen verleihen und ihre vorzeitige Schließung verhindern. Sie haben als Darstellungsraum eminent produktiven und für das Experimentieren unverzichtbaren Charakter.[243]

In other words, laboratory protocols literally "represent" the thinkering-movements of the experimenter: *Forschungsnotizen sind Residuen von Suchbewegungen auf dem Papier.*[244] Documenting the process of experimentation is therefore of utmost importance for the historian, as this documentation is not only a constitutive element in the construction of the "epistemic thing", but also crucial "data" for the later analysis and interpretation of the "traces" of experimental thinkering. In fact, only the protocols turn the ephemeral traces into durable data.[245] As

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242 Rheinberger, *Spalt und Fuge*, Chapter 5: "Protokolle," 114–140.

243 Rheinberger, *Spalt und Fuge*, 132.

244 Rheinberger, *Spalt und Fuge*, 132.

245 On the concept of "traces" see Sybille Krämer, ed., *Spur. Spurenlesen als Orientierungstechnik und Wissenskunst* (Frankfurt am Main: Suhrkamp, 2007). On "reading traces" as a diagnostic method of historical reasoning, see Carlo Ginzburg, *Spurensicherung. Die Wissenschaft auf der Suche nach sich selbst* (Berlin: Wagenbach, 2011).

Van der Heijden and Kolkowski have demonstrated (▶ Practice, Chapter 3), it is important to take notes and document all phases of the experiment – from first ideas to the final realisation.

While Rheinberger's study offers ample evidence of the importance of written protocols as key elements in the epistemological regime of biological and biochemical laboratory experiments, "taking notes" is by no means a technology of knowledge specific to the sciences.[246] In fact, it is deeply rooted in the history of knowledge production and replication in the humanities. Making annotations, leaving marginal notes in books, producing excerpts, etc., have for

Fig. 18: Documenting the production of "Lichtenberg figures" (DEMA-workshop "Performing Media Archaeological Experiments" / December 2020) with multiple cameras and microphones in the studio of the Media Lab of the University of Luxembourg. Photo by Andreas Fickers. Courtesy of the C^{2}DH / University of Luxembourg.

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246 As a useful guide for students on how to take good notes even nowadays, see Söhnke Ahrens, *How To Take Smart Notes. One Simple Technique to Boost Writing, Learning and Thinking – for Students, Academics and Nonfiction Book Writers* (Warsaw: Create Space, 2017).

centuries marked engaged practices of reading as an active and creative process of reasoning.[247] But the technology of writing or sketching by hand or with the help of technical devices has long been enriched by other technologies and practices of documentation, such as photographs, films, or sound recordings, which have had a deep impact on discourses about objectivity, authenticity, or indexicality in the history and sociology of sciences,[248] but also in the field of media history and studies.

The "documentary impulse" that came with new media technologies such as photography, film, or sound recording affected practices of documentation in both the sciences and the "sciences of the everyday". As Greg Mitman and Kelley Wilder have argued, the "documentary impulse that emerged in the late nineteenth century combined the power of science and industry with a particular utopian (and often imperialistic) belief in the capacity of photography and film to visually capture the world, order it, and render it useful for future generations".[249] As the many articles in their book *Documenting the World. Film, Photography, and the Scientific Record* demonstrate, these new practices of documentation with epistemic intent were deeply influenced by the ideals and norms of scientific communities. According to Mitman and Wilder, the "documentary impulse" of both photography and film converged in the early twentieth century around the problem of "seeing life" and "representing time":

> It might be that the timely confluence of photography in the hard sciences, the human sciences, and "modern" archival and document sciences in Western societies achieved an elevated status for the photographic "record" as a document invested with appropriately scientific levels of neutrality, objectivity, and reliability.[250]

As media theorists and historians, we are of course very much aware of the constructed nature of such documentary evidence.[251] Despite the persistence of marketing tropes such as "seeing is believing" or "high fidelity" that still frame public discourses of authenticity and truth, the documentary evidence of photographs, films, or sound recordings remains "mediated". As epistemic things,

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247 Alberto Manguel, *A History of Reading* (New York: Penguin, 1996); Michel de Certeau, *The Practices of Everday Life*, vol. 1 (Berkeley: University of California Press, 1994).

248 Lorraine Daston and Peter Gallison, eds., *Objectivity* (Cambridge, MA: MIT Press, 2010).

249 Gregg Mitman and Kelley Wilder, "Introduction," in *Documenting the World. Film, Photography, and the Scientific Record*, ed. Gregg Mitman and Kelley Wilder (Chicago: University of Chicago Press, 2016), 1.

250 Mitman and Wilder, "Introduction," 12.

251 John Tagg, *The Burden of Representation. Essays on Photographies and Histories* (Minneapolis: University of Minnesota Press, 1993).

they are constituted through a set of relations that give them agency in the world. Despite this epistemological status of "in betweenness" of photographic or filmic "documents",[252] their evidentiary value and authority becomes validated through processes of circulation and archiving, turning them into "records". This process of turning evidentiary documents into narrative objects that finally end up as archival records make protocols a typical "boundary object",[253] in which "meaning" and "fact" lie not simply inside the photographic material but in a set of relationships formed between the maker, the user, the object, and the archive".[254]

How strongly the "documentary impulse" affected not only hard sciences but the "sciences of the everyday", such as amateur photography, filmmaking, or sound hunting, has been studied at length in the field of media history. In her seminal study, *The Camera as Historian. Amateur Photographers and the Historical Imagination*, Elizabeth Edwards has offered a fascinating account on the popular photographic survey movements that emerged from the "same epistemological frames of encyclopaedic desire, positivist confidence, preservational impulse, and a concern with narratives of the past, present, and future that are entangled with similar discourses of photographic reliability and public utility".[255] In a similar vein, Elizabeth Cowie,[256] John Ellis,[257] and Maxime Scheinfeigel[258] have deconstructed the myth of the documentary film or television camera as "neutral observer" or "disinterested eye", and instead highlighted the "documentary desires" and "evidential rhetorics" that inform such documentary practices. Yet all authors underline the intrinsic relationship between the indexical or mimetic qualities of audiovisual recording technologies and their imprint on our historical imagination.

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252 On the "vitality" or "duration" of photographic images, see Geoff Dyer, *The Ongoing Moment* (New York: Vintage Books, 2005).

253 Ulrike Bergermann and Christine Hanke, "Boundary Objects. Boundary Media. Von Grenzobjekten und Medien bei Susan Leigh Star und James R. Griesemer," in *Grenzobjekte und Medienforschung,* ed. Sebastian Grießmann et al. (Bielefeld: Transcript Verlag, 2017), 117–130.

254 Mitman and Wilder, "Introduction," 3.

255 Elizabeth Edwards, *The Camera as Historian. Amateur Photographers and the Historical Imagination* (Durham: Duke University Press 2012), 5.

256 Elizabeth Cowie, *Recording Reality, Desiring the Real* (Minneapolis: University of Minnesota Press, 2011).

257 John Ellis, *Documentary. Witness and Self-Revelation* (London: Routledge, 2011).

258 Maxime Scheinfeigel, *Jean Rouch* (Paris: CNRS Éditions, 2008). See especially chapter 4 "La fable documentaire," 101–116.

The stronger the evidentiary power of mimetic or indexical media, the higher our desire for an illusion of an "authentic experience" of the past.[259]

4.4 2nd Level Observation: Documenting Experiments in EMA

As has become clear by now, the historian-experimenter doing hands-on history research is acting in overlapping and interfering "spaces" of knowledge production: the mental space of thought experiment, the space of experimentation, the space of protocols and documentation, and the space of ex-post rationalisation or interpretation, eventually leading to the production of some format of scientific output. A specific challenge of doing experimental media archaeology lies in the fact that practices of documentation and the actual doing of experiments happen synchronically and thus interfere with each other. In the experimental mode, this simultaneity of documentary impetus (e.g., filming a basic or performative experiment with different cameras, from different angles and perspectives) and sensorial or bodily engagement with the object of study (e.g., a 9.5 mm. Pathé-Baby film projector) has both practical and epistemological implications.

From a practical point of view, the historian-experimenter has to carefully prepare the experimental setting in terms of the documentary technologies to be used. Depending on the object and type of experiment – a gaslighted Laterna Magica, an electro-magnetic tape-recording device, or a VHS video camera linked to a television screen – the positioning, framing, or focus of photo and/or film cameras, as well as the lighting conditions, have to be well defined and tested. As we know from ethnographic field research[260] or oral history theory,[261] the simple presence of such recording devices influences the social behaviour of and mental pressure on people. This not only counts for people that might be involved in a performative experiment, but for the historian-experimenter him- or herself, when using, for example, a live action camera (e.g., GoPro) to film the experiment from a first-person perspective (▸ Practice, Chapter 3.1). The intense use of documentary technologies can turn the laboratory into a "studio setting", where the course of actions performed by the historian-experimenter is to a large degree "scripted". While the heuristic potential of such a thick audio-

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259 Andreas Fickers, "Entre vérité et dire du vrai. Ein geschichtstheoretischer Grenzgang," in *Jeux sans frontières? Grenzgänge der Geschichtswissenschaft,* ed. Andreas Fickers et al. (Bielefeld: Transcript Verlag, 2017), 29–40.

260 See Pink, *Doing Visual Ethnography*.

261 Lynn Abrams, *Oral History Theory* (London: Routledge, 2015).

visual documentation lies in the possible capturing of gestures, bodily performances, or social interactions within the "ensemble play" of a performative experiment that would otherwise go unnoticed,[262] both the preparatory work and technical effort necessary, and the time and analytical work to be spent in the examination and evaluation of the mass of assembled data, have to be carefully weighed up against each other.

On an epistemological level, technologies of seeing or hearing for documenting experiments have had a huge impact on the development of experimental sciences – from the use of telescopes or microscopes in the seventeenth century to the use of photography in quantum physics (photographing traces of discharging of elementary particles in a cloud chamber) or ultra-sonic sound recording devices for the detection of cosmic radiation. Turned into "hermeneutic devices"[263] in their own right, media technologies have altered scientific and everyday practices of seeing and hearing – and as such shaped both our scientific and historical imagination.[264] In addition to this transcendent capacity of making "readable" things that are beyond human sensory perception, the documentary evidence of audio-visual recordings might allow us to study the otherwise difficult to grasp dimension of "tacit", "embodied", or "gestural" knowledge. Despite the fact that the attention of an experimenter is generally focused on handling a specific instrument or object, taking notes, measuring, or observing, many of his/her actions happen rather subconsciously or in a habitual and routine way. As such, audio-visual recordings might bear the potential of not only capturing the "focal attention" of the experimenter, but – and more importantly – what Michael Polanyi has described as "subsidiary attention", which can be forms of subliminal or marginal attention.[265] As it is very hard to "translate" such subconscious and embodied practical routines or gestures into text, or to describe them

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262 A good example of the added value of such an approach in the EMA is the ADAPT-project, "Researching the history of television production technology," see https://www.adapttvhistory.org.uk/ [last accessed 26.07.2022], and Amanda Murphy et al., "16MM Film Editing for Television: Using Filmed Simulation as a Hands-on Approach to TV History," *VIEW Journal of European Television History and Culture* 4, no. 7 (2015): 7–10.

263 Don Ihde, *Expanding Hermeneutics* (Evanston: Northwestern University Press, 1998). See also Peter-Paul Verbeek, *What Things Do. Philosophical Reflections on Technology, Agency, and Design* (University Park: Pennsylvania State University Press, 2005), especially Chapter 4, "A Material Hermeneutic," 121–145.

264 Thomas Hankins and Robert Silverman, *Instruments and the Imagination* (Princeton, NJ: Princeton University Press, 1995).

265 Michael Polanyi, "The logic of tacit interference," in *Knowing and Being. Essays by Michael Polanyi* (Chicago: Chicago University Press, 1969), 138–158.

in concrete terms, capturing them through the help of audio-visual documentary technologies is a possibility for making them visible / audible.

While phenomenological studies in the tradition of the French philosopher Maurice Merleau-Ponty have highlighted the central role of the body as a repository of knowledge gained through repetition, training, and experience, it remains hard to grasp the meaning of the unspoken or unwritten.[266] The "sensory turn" in cultural anthropology, ethnography, and to a certain degree in history of science and media studies, has produced a rich literature on everyday practices with special attention for the sensual dimension, mainly criticising the verbo-centric approach in those fields. Still, the methodological challenges of doing sensory ethnography, anthropology, or history remain huge – especially when aiming to analyse the senses from an inter-sensorial perspective.[267] The complex interaction of the senses in doing experiments asks for a careful examination of the multiple
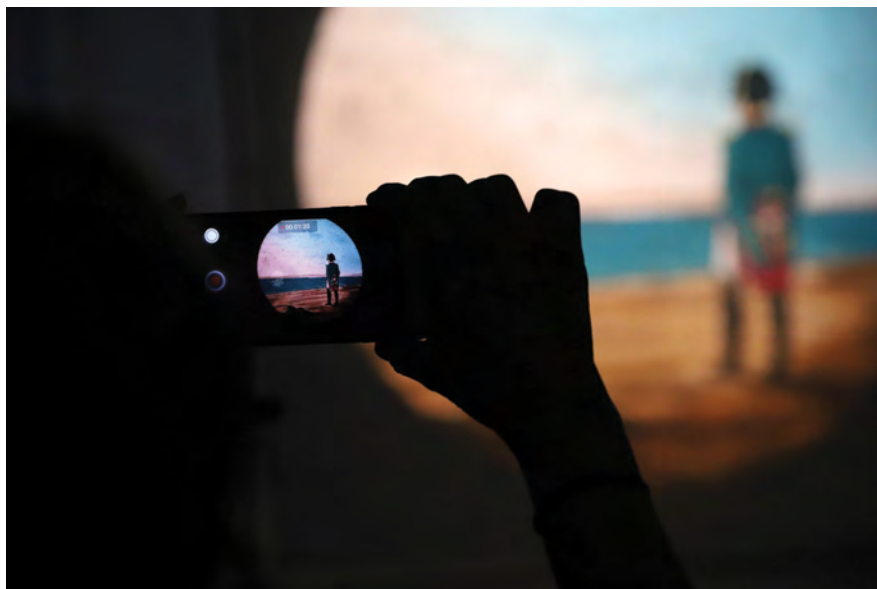
Fig. 19: Documenting the Magic Lantern hands-on workshop with Karin and Ludwig Vogl-Bienek (Illuminago) at the Digital History Lab / University of Luxembourg in May 2015 with the smartphone. Photo by Noelle Schon. Courtesy of the C^{2}DH / University of Luxembourg.

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266 Regina Bendix and Donald Brenneis, "The Senses," *Etnofoor: Anthropological Journal* 18, (2006): 1.

267 David Howes and Constanze Classen, *Ways of Sensing. Understanding the Senses in Society* (London: Routledge, 2014).

sensory sensations at work when touching, hearing, seeing, and smelling old media technologies in a hands-on activity.[268] Using video cameras or audio recording technologies to capture the learned movements of hands while cutting film tape on an editing table,[269] the whispering of joy or despair in the case of success or failure, or the non-verbal eye-contact and unwritten social norms framing the social interactions during a re-enactment of 16mm film crew for television,[270] enable an "emplacement" of the ethnographer/historian. As Sarah Pink explains: "ethnographic uses of audiovisual and audio media can be understood as both a research technique and as practices that become co-constituent of an ethnographic place. Thus we can consider digital recording devices to be part of the ethnographer's embodied mode of engagement and participation in her or his social, material and sensory environment".[271]

In this sense, documentation practices can be interpreted as "place making on a second level": first, they capture the "experimental space" in real time; second, this place is simultaneously "remade" as a recording. "As such", Sarah Pink concludes, "places are re-made as a representation of the experienced environments from which they have emerged".[272] In addition to the epistemological function of protocols described earlier, which one could qualify as epistemological objects of first order, the documentary evidence of audio-visual recordings in experimental media archaeology could be qualified as epistemological objects of a second order, allowing one to describe and analyse the phenomenological reality of bodily and social "aesthetics". As the media and film scholar David MacDougall has argued, such audio-visual documents are a new "language", operating in visual, aural, verbal, temporal and even tactile domains (through synesthetic association), able to make the implicit explicit.[273]

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268 As historians of the senses have shown, the reduction to five senses is a Western cultural convention, deeply rooted in theological and philosophical speculations about a hierarchy of senses. See Robert Jütte, *Geschichte der Sinne. Von der Antike bis zum Cyberspace* (München: C.H. Beck, 2000), 65–82. Yet non-Western civilizations and even modern science (especially physiology, anatomy, and neurology) have largely expanded the range of senses or sensorial capacities. See Bodo Mrozek, "Die achtzehn Sinne," *Merkur* 74 (2020): 59–66.

269 See Amanda Murphy et al., "16MM Film Editing for Television," https://www.viewjournal.eu/articles/10.18146/2213-0969.2015.jethc077/ [last accessed 26.07.2022].

270 John Ellis, "Filming for Television: How a 16mm Film Crew Worked Together," V*IEW. Journal of European Television History and Culture* 8, no. 15 (2019): 91–110, https://www.viewjournal.eu/articles/10.18146/2213-0969.2019.jethc167/ [last accessed 26.07.2022].

271 Pink, *Doing Sensory Ethnography*, 125.

272 Pink, *Doing Sensory Ethnography*, 125.

273 David MacDougall, *The Corporeal Image: Film, Ethnography, and the Senses* (Princeton, NJ: Princeton University Press, 2005).

4.5 New Forms and Formats of Evidence-Based Storytelling in Academia

But how to make use of the documentary evidence for new forms of historical storytelling? Inspired by the international success of the object lessons, a blog series initiated by Ian Bogpost (Georgia Institute of Technology, *The Atlantic*), Christopher Schaberg (Loyola University New Orleans), and Ross Anderson (*The Atlantic*) eventually turned into a book series with Bloomsbury Publishing.[274] Art historian Ann-Sophie Lehmann has explored the literary possibilities of producing object lessons in an academic setting, concluding that such an active engagement with objects as both "things" and "sources" provokes a "double reflexivity": "Nicht nur über das Verhältnis von Wort und Ding an sich, sondern auch über die Wissensvermittlung mit und durch Material".[275]

The so-called "material turn"[276] in cultural studies and the humanities has produced a great number of "biographies of objects" and made them a popular narrative genre in archaeology,[277] musicology,[278] ethnography,[279] museology,[280] and the history of science and technology,[281] which eventually became a fashion of writing the history of everything in 100 objects. This was partly inspired by the enterprise of the Director of the British Museum in London who wrote a history of the world based on a selection of the museum's colonial collection, initiating a multifaceted rethinking of the historiographical and epistemological makeup of the collection.[282]

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274 Particularly interesting in this series is the reflection on the Remote Control by Caetlin Benson-Allott, who helps understand their history and impact on our daily lives: http://object sobjectsobjects.com/about/ [last accessed 26.07.2022].

275 Ann-Sophie Lehmann, "Objektstunden. Vom Materialwissen zur Materialbildung," in *Materialität,* eds. Herbert Kalthoff, Torsten Cress, and Tobias Röhl (Leiden: Brill | Fink, 2016), 189.

276 By way of introduction, see Ian Woodward, *Understanding Material Culture* (London: Sage 2007). See also Fossati and Van den Oever, eds., "Introduction," *Exposing the Film Apparatus*, and the Introduction to this book.

277 Chris Gosden and Yvonne Marshall, "The Cultural Biography of Objects," *World Archaeology* 31, no. 2 (1999): 169–178.

278 Christina Dörfling et al., eds., *Musikobjektgeschichten. Populäre Musik und materielle Kultur* (Münster: Waxmann, 2021).

279 Janet Hoskins, "Agency, Biography, and Objects," in *Handbook of Material Culture*, eds. Chris Tilley et al. (London: Sage, 2006), 74–84.

280 Kate Hill, ed., *Museums and Biographies. Stories, Objects, Identities* (Woodbridge: Boydell Press, 2014).

281 Lorraine Daston, ed., *Biographies of Scientific Objects* (Chicago: Chicago University Press, 2000); Frode Weium and Tim Boon, eds., *Material Culture and Electronic Sound* (Washington D.C.: Smithsonian Institution Scholarly Press, 2013).

282 Neil MacGregor, A *History of the World in 100 Objects* (New York: Penguin, 2013).

Without denying the relevance of such "biographies of objects" as a new form of presentation, we would like to emphasise the importance of playing with new forms and formats of experimentation and storytelling when doing so. As some of the information and experiences we aim to convey in experimental media archaeology is sometimes difficult to translate or express in words – we already stressed the need of a "second tongue" based on Serres' philosophy of the mingled bodies in our "Plea" from 2014 – experimenting with creative forms of historical storytelling also offers the possibility of reintroducing a sensory dimension into the narrativization of our historical findings. One such possibility are so-called performance lectures, of which "staging the amateur film dispositif" is one example we realised in the framework of the "International Orphan Film Festival" in Amsterdam in 2014. This staging of a live re-enactment of home movie screening dispositifs during an academic conference sensitised the "re-enactors" for the "intercorporeal knowing"[283] that emerges during performative media practices,[284] and it offered an immersive experience for the participating audience, turning them into sensorially engaged spectators.[285] In the reflexive report of this event, media historian Susan Aasman highlighted the specific relationship between "actors" and "audience" during the performance.[286] Framed as an "art of failure", performance lectures enable the audience to take part in the research process as such, as Aasman points out, and thereby affirm the performance of on-stage research as a distinguished feature of knowledge transfer. According to Tilmans, Van Vree and Winter, herein lies the excitement of the performance lecture or public re-enactment – as well as its distortions and surprises: "Re-enactment is both affirmation and renewal. It entails addressing the old, but it also engenders something new, something we have never seen before".[287]

Performance lectures or academic re-enactments remain rather rare forms of scholarly narrativization of history, and the question of narrativization and

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283 Jon Hindmarsh and Alison Pilnick, "Knowing Bodies at Work: Embodiment and Ephemeral Teamwork in Anaesthesia," *Organization Studies* 28, no. 9 (2007): 395–416.

284 See Andreas Fickers, "How to Grasp Historical Media *Dispositifs* in Practice?" in *Materializing Memories. Dispositifs, Generations, Amateurs,* eds. Susan Aasman, Andreas Fickers, and Joseph Wachelder (New York: Bloomsbury, 2018), 85–99.

285 On the re-enactment during the 9th edition of the International Orphan Film Symposium (https://wp.nyu.edu/orphanfilm/ [last accessed 26.07.2022]) held at the EYE Film Institute (https://www.eyefilm.nl/en [last accessed 26.07.2022]) in Amsterdam (31 March 2014), see the blog post, Susan Aasman, "Staging the Amateur Dispositif," https://homemoviesproject.word press.com/2014/06/27/staging-the-amateur-dispositif/ [last accessed 26.07.2022].

286 See "Staging the Amateur Dispositif."

287 Karin Tilmans et al., eds., *Performing the Past. Memory, History, and Identity in Modern Europe* (Amsterdam: Amsterdam University Press, 2010), 7.

storytelling in experimental media archaeology scholarship requires more attention here. To a certain degree, podcasts and video-essays have made their entry into academia more prominently. Audio or audio-visual formats of historical storytelling exploit their full narrative and analytical potential when they turn recorded sounds and/or images into integral parts of historiographical argumentation. Instead of reducing the indexical and immersive quality of sounds and (moving) images to mere illustrations of textual narratives based on academic conventions of writing history, digital formats of transmedia storytelling offer new possibilities of multi-linear and multi-vocal narrative compositions, as well as participatory and interactive designs.[288] Yet the production of such experimental narratives requires a deeper engagement with the narrative codes and conventions of different media – something that is rarely acquired in the rather classic academic curricula of history programs. But without a serious engagement and hands-on experimentation with the tools and technologies of storytelling, the potential of multimodal pedagogies that inspire hybrid genres of storytelling will remain unexplored.[289]

In our case, playing and thinkering with past media technologies inspired us to think more creatively about new possibilities of showing and sharing our experiences by experimenting with non-traditional forms and formats of historical storytelling. In their video essay "On the Road Again: An Experimental Media Archaeology Journey to the Origins of Transnational Television in Europe", Andreas Fickers and Andy O'Dwyer reflect on the realisation of a media archaeological field trip to original locations of the transnational media event known as "Parisweek" in 1952. The video essay, based on a script enriched by historical sources (photographs, maps, archival documents including old television recordings), aims at sensitising television historians to the material remains, topography and physical spaces of early television transmissions.[290] They concluded that the experimental media archaeology journey (physically visiting the sites) brought a new layer of knowledge that could not be realised in any other way:

> Observing the topography (landscape) to see the chosen sights, Cassel, the towers of both Lille and Calais and Dover as "high-points" to take the pictures from Paris to London made us aware of the fragility and – to a certain degree – ephemerality of television

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288 Darin Barney et al., eds., *The Participatory Condition in the Digital Age* (Minneapolis: University of Minnesota Press, 2016).

289 Tracey Bowen and Carl Whithaus, eds., *Multimodal Literacies and Emerging Genres* (Pittsburgh: University of Pittsburgh Press, 2013).

290 Andreas Fickers et al., "'On the Road Again': An Experimental Media Archaeology Journey to the Origins of Transnational Television in Europe," *VIEW Journal of European Television History and Culture* 7, no. 13 (2018): 142–147.

infrastructures. Most of the physical constructions (transmitters) have disappeared, and even buildings that hosted important equipment (such as the Casino in Cassel, where the line conversion was realized) disappeared or show no more sign of the former activities (such as the clock tower in Lille which hosted the first regional television studio in France). There seems to be little awareness for the material heritage of a technology that was once praised as most revolutionary invention in human history . . . .[291]

Through the mixing of archival traces with audio-visual documentation (including interviews) produced during the field trip, the video essay shows an interesting moment of communicative memory production, bringing two distinct or parallel traditions of the same event into contact with each other:

> As the locals had never seen the BBC documentary nor any other filmic sources covering the event, our media archaeological experiment has – in a certain way – broken down the transnational and European dimension of the event to the local level; and, the other way around, enriched the transnational story by local memories and knowledge. In this way, the idea of EMA – that it so sensitize the historian for the materiality and performativity of old media technologies and to reflect on the sensorial and social dimension of doing media history in a hands-on and re-enactment approach – has without doubt proven its intellectual and performative usefulness in this EMA-journey.[292]

The video essay "On the Road Again" aimed at demonstrating the feasibility and heuristic potential of doing an EMA field trip and turning this experience into a transmedia narrative to be published in an academic online journal.

In contrast to this academic exercise, the production of the radio-play "Glanz und Elend der Kunstkopf-Stereofonie" (Glory and Misery of Dummy Head Stereo Recording) was driven by the ambition to experiment with the medium of radio to tell a story that could hardly have been told through the medium of text or film. Drawing on the findings of a research project entitled "Failure and Success of Dummy Head Stereo: An Innovation History of 3D Listening",[293] Stefan Krebs and Andreas Fickers decided to produce a radio-play that would enable them to argue with sound rather than text. Realised in collaboration with a professional radio producer from Bavarian Broadcasting (BR) in Munich, former technicians that had worked with the Kunstkopf in the 1970s and professional actors (such as Hans Peter Hallwachs who played one of the main characters in the very first binaural radio drama "Demolition" in 1973), the play told the story of dummy head recording by simultaneously demonstrating

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291 Fickers et al., "'On the Road Again'," 146.
292 Fickers et al., "'On the Road Again'," 146.
293 The 2-year Post-Doc project of Dr. Stefan Krebs was funded by the Fonds National de Recherche (FNR) in Luxembourg. For further information, see the academic blog of the project: https://binauralrecording.wordpress.com/ [last accessed 26.07.2022].

binaural technology. As such, the play made the history of Kunstkopf-technology – its technical advantages but also problems – immediately audible for the listener.[294] The double ambition of this audio narrative was to explain the complex technology of binaural recording – and the reason for its failure – to a broad audience, and to let listeners experience three-dimensional audio reproduction by fully engaging the sense of spatial hearing. The transmission of the radio play on the public broadcasting station "100,7" in Luxembourg enabled a wide diffusion of this experimental research output and triggered interesting debates about the future of historical storytelling in general.[295]

Fig. 20: Presentation of the 3D-radio play "Glory and Misery of Dummy-head Recording" by Stefan Krebs at the IAMHIST-Masterclass on Media and History at the Centre National de l'Audiovisuel (CNA) in November 2019 in Dudelange / Luxembourg. Photo by Andreas Fickers. Courtesy of the C[2]DH / University of Luxembourg.

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294 Stefan Krebs, "»Glanz und Elend der Kunstkopf-Stereophonie«. Eine technik- und medienarchäologische Ausgrabung," in *Jeux sans frontières. Grenzgänge der Geschichtswissenschaft,* eds. Andreas Fickers et al. (Bielefeld: Transcript, 2017), 57–70.
295 For a 360-degree visualisation of the recording of the radio play in studio 8 of Bavarian Broadcasting, see https://binauralrecording.wordpress.com/2019/01/21/radio-play-new-slide

4.6 Conclusion

New forms of digital curation and presentation of "objects in use" are likely to change the way we will study past media technologies and practices in the future. Projects such as the "Epistemes of Modern Acoustics" at the Max Planck Institute for the history of science in Berlin,[296] or the "Filmfarben. Technologien, Kulturen, Institutionen" project by Barbara Flückiger at the Institute for Film Studies / University of Zurich[297] have produced innovative databases and timelines which serve as multimedia resources for historians, curators, and technical experts and practitioners. The "Sound & Science: Digital Histories" platform that emerged from the "Epistemes of Modern Acoustics" project invites users to explore how acoustic knowledge travelled between science, musicians, engineers, or everyday listeners:

> The database provides difficult-to-access sources in the history of acoustics, such as texts, images, sound recordings, historical re-enactments of acoustic experiments, along with entries on the key figures, places, instruments, and technologies that have shaped this history. The source material is presented through curated categories, while an extensible tagging system facilitates research navigation and identifies construction materials, concepts, personal networks, and timelines in the history of acoustics. The print publications of research scholars can be linked back to the database using QR codes. The database also serves as a platform for multimedia essays by linking various different sources.[298]

In a similar vein, the interactive "Timeline of Historical Film Colors"[299] enables users to access information on over 250 individual film colour processes via the classification system, to search via a tag cloud and to see the contributing archives' collections.[300] The online video lectures of Paolo Brenni from the "Museo Galileo" in Florence,[301] showcasing hands-on demonstrations of scientific instruments, is yet another inspiring example of how the Internet and digital

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show-with-english-subtitles/ [last accessed 26.07.2022]. The play can still be listened to also (you need headphones to reproduce the 3D sound effects): https://www.c2dh.uni.lu/de/data/glanz-und-elend-der-kunstkopf-stereophonie [last accessed 26.07.2022]. On the public discussion about new forms of historical storytelling in the framework of the "Forum Z", see https://www.c2dh.uni.lu/fr/forum-z/forumz-future-storytelling-history [last accessed 26.07.2022].

296 https://www.mpiwg-berlin.mpg.de/research/projects/RGTkaczyk [last accessed 26.07.2022].

297 https://www.film.uzh.ch/de/research/projects/verbund/filmfarben.html [last accessed 26.07.2022].

298 Quote from https://soundandscience.de/about [last accessed 26.07.2022].

299 See https://filmcolors.org/#/ [last accessed 26.07.2022].

300 https://filmcolors.org/#/ [last accessed 26.07.2022].

301 See https://www.youtube.com/watch?v=o7A4jyFG7hE [last accessed 26.07.2022].

communication platforms can serve as means for the circulation of knowledge beyond the classical forms and formats of scholarly publications. The intellectual and pedagogical benefits of sharing the documentary evidence of hands-on history initiatives in order to promote a new way of historical learning will be discussed in the next chapter.

Chapter 5
The Value of Experimental Media Archaeology for Education and Research

5.1 Introduction

This chapter is devoted in its entirety to a reflection on the value of experimentation for research and education. We will specifically look into the affordances of the proposed four types of experimentation and the different modes of experimentation, documentation, and presentation. As part of the assessment, this last chapter will include a discussion of some specific questions raised by Chapter 4 – for instance, how the specific types of experiments shape the epistemic object, and how they invite or demand specific modes of recording, documentation, presentation and narration.

5.2 Learning by Re-doing and Artist-Run Experiments

More than the knowledge, it is learning that informs the practices of experimental media archaeology. The "learning by doing" approach of experimental media archaeology is deeply rooted in the "experimental spirit" that characterises scientific curiosity and, as such, it is perfectly suited to combining research with innovative forms of problem-based learning and teaching, the central missions of higher education and universities in our times. There is a long tradition of "experimental training" and "laboratory teaching" in the sciences, where the performance and re-doing of experiments in the classroom have served purposes of stabilisation and iconization of scientific knowledge and practices.[302] However, such standards and protocols are completely lacking in the field of media history. To a certain degree, best practices of this kind do exist in the field of experimental archaeology,[303]

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302 See Peter Heering and Roland Wittje, eds., *Learning by Doing. Experiments and Instruments in the History of Science Teaching* (Stuttgart: Steiner, 2011); Peter Heering, Michael Markert, and Heiko Weber, eds., *Experimentelle Wissenschaftsgeschichte didaktisch nutzbar machen. Ideen, Überlegungen und Fallstudien* (Flensburg: Flensburg University Press, 2012).
303 See Allen K. Outram, "Introduction to Experimental Archaeology," *World Archaeology* 40 (2008): 1–7; Dana Millson, *Experimentation and Interpretation: The Use of Experimental Archaeology in the Study of the Past* (Oxford: Oxbow Books, 2010).

historical musicology,[304] art history,[305] and cultural anthropology / ethnography.[306] They inform the approaches in experimental media archaeology put forward in this book.

What makes media archaeological experiments as modes of historical learning special, however, is the inherent quality of media technologies as "dispositifs of attraction".[307] They are made to astound audiences in historical practices of use, which help to maximise these effects. Media archaeologists, Erkki Huhtamo among them, have pointed at the performative quality of obsolete media technologies and optical toys. It is a quality which can be brought to the fore once again in practices of re-use by artists as well as researchers and educators.[308] They show the close bond between artistic experimentation, entertainment, education and playful practices of learning.[309]

That amusement, research and educational functions coexist and are fused in such practices of reuse does not mean that they coexist in all types of experiments in the same way. As Huhtamo argues, media-archaeological research can be "a form of armchair travel", yet it does come with rules: "it cannot be practised in an anarchic fashion. When an artist jumps into the time machine and grasps the controls, one may expect a wilder ride, taken to the limits of the

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304 John Butt, *Playing with History. A Historical Approach to Musical Performance* (Cambridge: Cambridge University Press, 2002); Stephen Crist and Roberta Montemorra Marvin, eds., *Historical Musicology. Sources, Methods, Interpretations* (Rochester: University of Rochester Press, 2004); Nancy November, ed., *Performing History. Approaches to History Across Musicology* (Boston: Academic Study Press, 2020).

305 Ann-Sophie Lehmann, "Showing Making: On Visual Documentation and Creative Practice," *The Journal of Modern Craft* 5, no. 1 (2012): 9–23; Leslie Carlyle, "Reconstructions of Oil Painting Materials and Techniques: The HART Model for Approaching Historical Accuracy," in *Reconstruction, Replication and Re-enactment in the Humanities and Social Science*s, eds. Sven Dupré et al., 141–168.

306 Sarah Pink and Kerstin Leder Mackley, "Re-enactment Methodologies for Everyday Life Research. Art-Therapy Insights for Video Ethnography," *Visual Studies* 29 (2014): 146–154.

307 Frank Kessler, "La cinématographie comme dispositif (du) spectaculaire," *Cinémas* 14, no. 1 (2003): 21–34; Strauven, ed., *The Cinema of Attractions Reloaded*.

308 As Volume 2 makes abundantly clear, teasing out the performative quality of obsolete technologies *in practice* is not always easy, even when the devices can still be used. Highly problematic are those technologies which have become *really* obsolete media technologies, meaning those media that are now *unusable* due to a lack of infrastructures or hardware.

309 Huhtamo, *Illusions in Motion*. For demonstrations of the reuse of obsolete technologies from Huhtamo's own collection, see "Professor Huhtamo's Cabinet of Media Archaeology"; this title in itself marks the fusion of educational, research, and entertainment functions. You will find more examples at https://www.youtube.com/watch?v=V37S95AE3Pc [last accessed 26.07.2022]. Huhtamo's collection is also online: http://www.erkkihuhtamo.com/collection/ [last accessed 26.07.2022].

imagination".[310] In other words, artists may be expected to design and execute experiments that seek the extremes of the perceptual and sensorial continuum, seeking the maximal impact on the imagination. For this reason, the media archaeological experiments by artists – among them Zoe Beloff,[311] David Hockney,[312] and William Kentridge[313] – are of special interest to the field of experimental media archaeology. Their extensive experiments with historical media technologies and practices of use deserve special attention in our field, as they form such a rich source of information on well-designed media archaeological practices of re-use and hands-on history. As Huhtamo wrote:

> To be worth being identified as media-archaeological, an artwork must evoke earlier media in one way or another. Such works can be treated as "metacommentaries" on media culture, its motifs, its structures, and its ideological, social, psychological, and economic implications.[314]

Such artist's experiments form a direct source of inspiration for the design of media archaeological experimentation in teaching and research. By studying them, we can learn a lot about the ways in which artists set up and execute their artistic experiments, e.g., in performances that are in themselves (media) art works, providing access to the perceptual, sensorial and illusionary dimensions of media use executed skilfully and effectively, while seeking an impact on the spectator's imagination.

Exquisite examples of media archaeological experiments of interest to experimental media archaeology are to be found throughout William Kentridge's work. For good reasons, Kentridge's media art has long attracted attention from film and media museums. Particularly interesting is his reuse of so-called precinema and early cinema devices and nineteenth-century optical toys. Among them are his experiments with the phenakistoscope. It is remarkable to see how Kentridge returns to an era of the cinema when moving pictures were not yet photographically produced and mechanically projected, but hand-painted and

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310 Erkki Huhtamo, "Art in the Rear-View Mirror. The Media-Archaeological Tradition in Art," in *Companion to Digital Art*, ed. Christiane Paul (Oxford, West Sussex: John Wiley & Sons, 2016), 72.

311 For instance, see Zoe Beloff's media-archaeological experiments, such as the re-doing of Sergei Eisenstein's "The Glass House." More examples are discussed in Huhtamo, "Art in the Rear-View Mirror," 72–73.

312 For instance, see David Hockney's media-archaeological experiments with the *camera obscura*: see Hockney 2001, discussed in Huhtamo, "Art in the Rear-View Mirror," 72–73.

313 See Harmon Siegel, "Feats of Prestidigitation," in *William Kentridge: Smoke, Ashes, Fable*, ed. Margaret K. Koerner (New Haven, London: Yale University Press, 2018), 142–172.

314 Huhtamo (1995), cited in Huhtamo, "Art in the Rear-View Mirror," 72.

hand-manipulated. It came with a set of skills kept alive up to this day in (stop motion) animation. This topic has attracted attention from art historians, among them Harmon Siegel,[315] who uses insights from early cinema studies and New Film History[316] to create a new framework for understanding Kentridge's use of so-called pre and early cinema devices in his artworks. Siegel's aim is to create new insights into Kentridge's creative process as a post-colonial, Johannesburg-based artist, who purposefully reuses these early cinema devices and avant-garde techniques for critical and political purposes.[317] This is no doubt a valuable contribution to art history, both from a postcolonial as well as a media-archaeological perspective. In addition, we would like to plead for further study of Kentridge's skilful and artful experiments – and his detailed reflections on them – as they form such rich sources of information and inspiration on the practices of "re-doing". They are of special interest to experimental media archaeology, because his hands-on experiments with early cinema devices – many of them inspired by quick-handed magicians from the Méliès era[318] – show how to concretely design re-enactments with historical devices to effectively resensitize researchers and deepen their insights into the performative and sensorial potential of past media.

For similar reasons, David Hockney's hands-on experiments with the camera obscura form relevant study material for experimental media archaeology.[319] They have been so far studied by art historians in terms of Hockney's ongoing experimentation with perspective in his paintings.[320] To experimental media archaeology, in addition, they present skilful and informative reflections on his hands-on experiments with optical devices of the first and second type, describing basic technical experimentation and media-archaeological experimentation respectively. In terms of modes of experimentation, two modes used by Hockney attracted our attention: first, Hockney's demonstration of forms of *thinkering*, accompanied by his particularly interesting comments, often added in the form of a "voice over" to the audio-visual recordings of his tinkering; second, Hockney's

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315 See Siegel, "Feats of Prestidigitation," 142–172.

316 Among the early cinema studies and New Film History sources of relevance to Siehel are Tom Gunning's reflections on the "aesthetics of astonishment" and "devices of wonder" such as the thaumatrope, already mentioned.

317 Siegel, "Feats of Prestidigitation,"142–172.

318 See Siegel, "Feats of Prestidigitation,"142–172.

319 A source of knowledge on the topic is David Hockney, *Secret Knowledge. Rediscovering the Lost Techniques of the Old Masters* (London: Thames & Hudson, 2006). In addition, Hockney's and Charlie Rose's interesting and well-illustrated dialogue is "David Hockney, The Lost Secrets of the Old Masters: camera lucida obscura," https://www.youtube.com/watch?v=Ldi syiLOtmM [last accessed 26.07.2022].

320 See Huhtamo, "Art in the Rear-View Mirror," 72.

artistic mode of experimentation, with implications for the study of the impact on perception and experience. Equally relevant are Hockney's hands-on, technically skilful re-doings of Van Gogh's brushstrokes, qualifying as media archaeological experiments of the third "performative" type, with a particularly strong impact on the historical imagination.[321]

Another artist whose experimentation deserves careful study from a media archaeological perspective is Zoe Beloff. Her *Glass House*[322] presents her "execution" of Sergei Eisenstein's unrealized project "The Glass House". She did so to find out what it was that he was envisioning, technologically as well as ideologically and artistically, using his plans, his reflections, and his drawings. We are specifically interested in these media artworks as skilfully designed "re-doings" with an original and creative setup. They provide useful lessons in *doing* experimental media archaeology and a powerful entry into the sensorial dimensions of media history. Moreover, as evocative artist-designed experiments, they have a particularly strong impact on the historical imagination.

Interestingly, Erkki Huhtamo traces the origins of media archaeology itself in such artistic practices and the art-historical practices they inspired in research and teaching: "As novel as media-archaeological art seemed in the late 1980s, it is now clear that its origins – as well as those of media archaeology itself – must be traced further back in time". Huhtamo argues that "early formative contributions to media archaeology can be traced to the work of scholars like Aby Warburg, Walter Benjamin, Dolf Sternberger, and Ernst Robert Curtius, active in the first half of the 20th century".[323] Although all these traces are interesting in terms of an archaeology of (the making of) art, Huhtamo adds that "[i]t would be difficult to claim that media-archaeological attitudes developed before the 20th century", because the earlier references "mostly concerned styles and

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321 The exhibition "Hockney – Van Gogh: The Joy of Nature", at the Van Gogh Museum in Amsterdam in 2019, offered a wealth of insights into Hockney's hands-on study of Van Gogh. Small parts of the recordings of Hockney's experiments with re-doing Van Gogh's brushstrokes (and paintings) are presented in "Hockney on Van Gogh," https://www.youtube.com/watch?v=vA [last accessed 26.07.2022]. Particularly interesting also are his experiments with material and devices and reflections on his experiments for *The Invention of Spring,* https://www.youtube.com/watch?v=Cdqch3-D94A [last accessed 26.07.2022].

322 *Glass House* was made as a tribute to one of Eisenstein's "unrealized projects", "The Glass House", by Zoe Beloff, with cinematographer Eric Muzzy, in 2014: https://www.youtube.com/watch?v=sG0LGrW7o0o [last accessed 26.07.2022].

323 This is a reference to Erkki Huhtamo and Jussi Parikka, eds., *Media Archaeology. Approaches, Applications, and Implications* (Berkeley, CA: University of California Press, 2011), 3, 6–7, 14; this discussion is taken from Huhtamo, "The Media-Archaeological Tradition in Art," 72–73.

motifs [. . .] rather than tools and conditions of visual illusions".[324] Exceptionally interesting, then – also to an artist like Kentridge – is the quirky use *of tools* by the avant-gardists, partly because of their visionary perspectives, but also because they tend to carefully stay outside the mainstream, if not effectively aiming to go against the practices of technological standardisation. As such, the avant-gardists' theatrical reflections and innovative and technology-saturated artistic practices, Antonin Artaud's among them, were recommended for study by Zielinski to his 1990s students in new media at the *Hochschule* in Köln because he assumed it would help them develop their own artist-informed new media practices.[325]

5.3 On Wonder and the Enduring Magic of Media Technologies as "Dispositifs of Attraction"[326]

What most if not all the examples of experimentation discussed here share is a promise to create deeper insights into the "enduring magic"[327] of many media technologies. This goes for Laterna Magica projections used for entertainment and education,[328] and for the multitude of optical devices designed for home entertainment and amateur experimentation: the thaumatrope, the phenakistoscope, the zoetrope, the praxinoscope, and the kinetoscope or mutoscope, to name just a few. As Wanda Strauven argues, their use was not one of passive consumption of fantastic (moving) images, but involved a performance that

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324 Huhtamo and Parikka, *Media Archaeology,* 72–73.

325 Siegfried Zielinski, "Media Archaeology," *CTheory* (July 1996), https://journals.uvic.ca/index.php/ctheory/article/download/14321/5097 [last accessed 26.07.2022].

326 Title taken from Frank Kessler, "La cinématographie comme dispositif (du) spectaculaire," *Cinémas* 14, 1 (2003): 21–34; Wanda Strauven ed., *The Cinema of Attractions Reloaded*.

327 Thomas Elsaesser, "Freud and the Technical Media: The Enduring Magic of the Wunderblock," in *Media Archaeology*, eds. Huhtamo and Parikka, 95–117.

328 See, for example, the project "A Million Pictures. Magic Lantern Slide Heritage as Artefacts in the Common European History of Learning," and Sarah Dellmann, "Lecturing without an Expert: Word and Image in Educational 'Ready-Made' Lecture Sets," https://a-million-pictures.wp.hum.uu.nl/wp-content/uploads/sites/210/2017/01/Dellmann_Lecturing-without-an-expert.pdf [last accessed 26.07.2022]. See also projects run by Ludwig Vogl Beinek and Martin Loiperdinger, e.g., the DFG research project, "Performative Configurations of the Art of Projection for the Popular Transfer of Knowledge. Media Archaeological Case Studies in the History of Useful Media and the Screen" (2019–2021) at the Institute for Media Studies at the Philipps University of Marburg. See also Martin Loiperdinger and Ludwig Volg-Bienek, "Screening the Poor 1888–1914," DVD Edition Filmmuseum 64.

necessitated a direct bodily interaction between the "apparatus" and the opera-
tor.[329] The re-doing of such experiments or the re-enactment of performative
practices, such as lantern shows, home movie film screenings, or gramophone
sound recordings, not only aims at making things work again in a technical or
functional sense. They also aim to re-sensitize researchers by creating an authen-
tic sensorial and perceptual experience for the historian-experimenter, able to
leave an imprint on his / her historical imagination.[330] As part of the "historical
turn", film historians such as Tom Gunning have been pleading for the "re-
newing" of old technologies in research and education, to revive the "cycle of
wonder" they tend to induce.[331] Only recently, in 2020, he wrote that he saw the
profound didactic effects on students:

> Repeatedly I have experienced that moment when students experience the effect of the "de-
> vice of wonder" such as peering into a stereoscope and seeing the image as three-
> dimensional, or looking into a Mutoscope and seeing the picture cards become a moving
> image as they turn. I have called this sudden transformation the "wow" moment. Of course,
> the ability of a medium to seem neutral is also important, but I would claim that its aes-
> thetic role begins, as Aristotle claims about philosophy, in the moment of wonder.[332]

Within this context, it is important to once again stress that wonder is an emo-
tion of great interest to artists and educators alike and that both have been
using devices of wonder for a long time, creating an inquisitive attitude towards

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329 Wanda Strauven, "The Observer's Dilemma," 148–163. See also Patrick Ellis and Colin
Williamson, who argue that "[t]here is an aspect of theatre to these experiments and they ac-
cordingly emblematize a rapprochement between the sciences and the humanities. Some have
emphasised public-facing, popular science demonstrations, as in the University of St. An-
drews' 2013 Victorian Science Spectacular show, which included presentations of x-rays, atmo-
spheric gases, and electricity, all as public spectacle." Another example they mention
concerns art history: art historians have similarly brought such techniques into the classroom.
At the University of Utrecht, they have incorporated art historical re-enactments into first-year
classes; students learn practical glass blowing as it was accomplished in centuries past (Dupré
2017); see Ellis and Williamson, eds., "Object Lessons, Old and New: Experimental Media Ar-
chaeology in the Classroom," *Early Popular Visual Culture,* vol. 18, no. 1 (2020): 2–14.
330 We are referring here to our discussion of so-called re-sensitization effects and Sensitisa-
tion / Desensitisation Cycles (SDCs) in Chapter 3.
331 See Tom Gunning, Re-Newing Old Technologies" and our discussion of such cycles of
wonder in Chapter 3.
332 Gunning mentions in passing "the ability of a medium to seem neutral" as also being
"important", a note which must be understood in terms of the loss of wonder when users get
habituated to a certain device and accept it as "second nature" (Gunning and Van den Oever,
"Viktor Shklovsky's Ostrannenie and the 'Hermeneutics of wonder'," *Early Popular Visual Cul-
ture* 18, no. 1 [2020]: 15–28). See our discussion of the notable loss of sensitivity to the material
and sensorial impact of routinely used devices on historical users in Chapter 3.

the awe-inspiring. In his reflections on the thaumatrope or, literally, "wonder-turner", Gunning confirms the educational value of this simple "device of wonder" to trigger questions about the status of images, about illusion and seeing. The usefulness of such tools for educational purposes is evident: these toys helped to teach "scientific principles, thereby making education enjoyable and entertaining".[333]

Fig. 21: Student tinkering with a Phenakistoscope. Photograph by Julia Munuera Garcia. Courtesy of the Film Archive and Media Archaeology Laboratory of the University of Groningen.

Practices of redoing as simple as the ones we use in teaching are found to build on wonder and curiosity easily and fruitfully. The same goes for so-called Object Lessons, which thrive on wonder and have a long tradition in education

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333 As Gunning discusses, in research philosophical toys have provided "a particularly rich entry point for the analysis of technological images, as they did for many of the first students of the cinema, from C. W. Ceram to contemporary scholars such as Laurent Mannoni, David Robinson, Deac Rossell, and Erkki Huhtamo." Note that all these scholars had access to collections of historical devices and could re-use them to study their effects on the senses hands-on. See Gunning, "Hand and Eye: Excavating a New Technology of the Image in the Victorian Era," Papers and Responses from the Ninth Annual Conference of the North American Victorian Studies Association, *Victorian Studies* 54, no. 3 (2012): 495–516.

too. In their insightful "Object Lessons, Old and New: Experimental Media Ar-chaeology in the Classroom", Patrick Ellis and Colin Williamson reflect on the value of hands-on media-archaeological experiments in film education. More narrowly, they discuss the merits of hand-on experimentation in the context of the insights of the Swiss pedagogue Johann Heinrich Pestalozzi, the Ur-father of the Object Lesson, who "advocated for having students, primarily children, begin the learning process by engaging with physical artefacts before acting on them through language and reason".[334] Later educationalists such as Elizabeth Mayo and Edward Sheldon refined the practice of object-oriented education, their goal being "to lead students from sensory engagements with concrete ob-jects to abstract ideas". In passing, students were taught "to be mindful of their senses". Object lessons were used "to instil in students a deep curiosity and de-sire to learn", through what Mayo and Sheldon understood as "close readings of objects".[335] These insights have had a notable impact on art historical educa-tion and so-called material history. Particularly influential in the field of art his-tory was curator Barbara Maria Stafford, who promoted the learning process to be "shaped by carefully curated engagements with objects that aid in the pro-duction of a kind of 'sensationalized knowledge'".[336]

Patrick Ellis and Colin Williamson come to the conclusion that curiosity and wonder are "fundamental to initiating and sustaining the learning process". They argue that there tends to be a strong theatrical and performative dimension to the Object Lesson, which shares this common ground with "theatrical magic", ap-pealing to audiences invited "to learn the secrets behind the magician's tricks".[337] The "related premise that wonder leads to learning resonated strongly with many of the optical devices and spectacular visual entertainments that populate film

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334 Ellis and Williamson, "Object lessons, Old and New," 2–14. Their primary focus is not on the history of the object lesson: "Rather, we offer the object lesson as a framework for thinking about how hands-on uses of old media can open up innovative and unfamiliar spaces for stu-dents to experience and learn about film and media history", 6.

335 Ellis and Williamson, "Object lessons, Old and New," 2–14.

336 See Barbara Stafford's *Artful Science*, 51.

337 Ellis and Williamson, "Object Lessons, Old and New," They refer to a long list of studies confirming this, among them, Philip Fisher, *Wonder, the Rainbow, and the Aesthetics of Rare Experiences* (Cambridge, MA: Harvard University Press, 1998); J. Onians, " 'I wonder . . .' A short history of amazement" in *Sight and Insight: Essays on Art and Culture in Honour of E. H. Gombrich at 85*, ed. John Onians (London: Phaidon Press, 1994), 11; C. Bynum, *Metamor-phosis and Identity* (New York: Zone Books, 2001); Daston and Park, *Wonders and the Order of Nature* (New York: Zone Books, 2001). See Ellis and Williamson, "Object Lessons, Old and New".

and media history", and this rubbed off on the field of early cinema studies, as they argue.[338]

Fig. 22: Sound Postcard Recording with Aleksander Kolkowski at the "Temporary History Lab" in Esch-sur-Alzette in October 2020. Photo by Noelle Schon. Courtesy of the C²DH / University of Luxembourg.

5.4 On Playfulness, Failure, Creative Uncertainty, Confusion and the "Hermeneutics of Wonder"

Reflecting on the quickly developing field of early cinema studies in 2004, Thomas Elsaesser pleaded for a "hermeneutics of astonishment", or what is alternatively called a "hermeneutics of wonder", to serve as an impulse behind film historical research.[339] Gadamer's hermeneutics of wonder was a foundational point of

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338 See Ellis and Williamson, "Object Lessons, Old and New," 5. To name just one example, early cinema scholar André Gaudreault and his Montréal team of colleagues, Santiago Hidalgo among them, have increasingly devoted attention to the material studies of historical media technologies, in part in close collaboration with the Cinémathèque Québécoise in Montréal.

339 Thomas Elsaesser, "The New Film History as Media Archaeology," 113. An important point of reference is Tom Gunning, "An Aesthetics of Astonishment: Early Film and the Incredulous Spectator," *Art & Text*, no. 34, 1989, 31–45. As may become clear from the reference to Gadamer,

reference. Moreover, wonder is so much more than "fascination" or "mere curiosity", as James Risser wrote: wonder emerges at the limits of our understanding, when challenged by "the strange", when "the use of concepts and the use of language [break down]".[340] Interestingly, the historian Sarah Ann Carter captures this moment of confrontation with the strange (unfamiliar) as a *moment of confusion*: she describes the Object Lesson as "a medium of disorientation", explaining that "[n]early any material thing, placed at the centre of one's sustained analysis, may become surprisingly foreign, complex, and confusing".[341] A stirring example can be found in "Re-Newing Old Technologies", where Gunning evokes the response of a visitor to the World Exhibition of 1900 by unpacking her excited exclamation on a postcard home, which simply reads "Ooooooooooh!"[342] She expresses awe. The word *awe* itself is an onomatopoeia. It mimics the sound someone makes when breathing. The sound is sometimes transcribed as *awwwe*, sometimes as *ahhhhhhh*, and on this turn-of-the-century postcard as *Oooooooooh*. Especially relevant to us is that, in an experimental setting, such physical responses to devices of wonder can be observed and described in these very terms: the notable sound of breathing in, the sustained opening of the lips and mouth, and incidentally an almost cartoon-like dropping of the jaw that indicates a failing of the capacity to speak or think. There is an element of confusion. This has been analysed by cognitivists in terms of cognitive confusion when face to face with something that does not fit cognitive categories or templates used to process cues.[343] *Stupor* and *torpor* are terms used in aesthetics to describe a momentary lack of critical, mental functioning and a failing of verbal capacities. The English word *stupefying*, as the French *stupéfait*, has as a root the Latin *stupidus* ("struck senseless, amazed"), from *stupeō* ("be amazed or confounded, be struck senseless"). The senses stop functioning, as so do mental capacities. This raises a series of questions of interest to EMA too. We want to draw some attention at the end of this chapter to the moment of confusion, as it seems to us it is in need of further probing in future

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"wonder" is not the same as "astonishment", and the term "wonder" has a longer and perhaps also a richer history (in philosophy, phenomenology, theology) than "astonishment" has – yet the terms "hermeneutics of astonishment" and "hermeneutics of wonder" are used as synonyms.
340 James Risser, "Where Do We Find Words for What We Cannot Say? on Language and Experience in the Understanding of Life," in *Gadamer's Hermeneutics and the Art of Conversation*, ed. Andrzej Wierciński (Berlin: LIT, 2011), 221–230.
341 See the notes on Carter, as quoted and reflected upon in Patrick Ellis and Colin Williamson, "Object Lessons, Old and New."
342 Tom Gunning, "Re-Newing Old Technologies," 40–41.
343 Noël Carroll, "The Grotesque Today. Preliminary Notes Towards a Taxonomy," in *Modern Art and the Grotesque*, ed. Frances S. Connelly (Cambridge: Cambridge University Press, 2003), 291–311.

research. Of direct relevance to experimental media archaeology is: Can such a moment of confusion, a failing of the senses and the critical functions (thinking), be observed and recorded as part of experiments? Is there a specific relation between (media) technologies and such moments of speechlessness? In which cases is a positive and affirmative emotion triggered, and in which cases a negative one? Do these two groups of emotions, the affirmative ones and the negative ones, impact the (historical) imagination in crucially different ways?

Following Augustine's reflection on wonders, wonder is an emotion that has often been discussed in the sense of the miraculous and the "beyond", which plays such a big role in belief systems and religious ceremonies.[344] Awe is cued by the miraculous and, as Augustine famously claimed, "A portent is not contrary to nature, but contrary to our knowledge of nature".[345] As Carrol argues in his interpretation of this famous dictum by Augustine, the miraculous simply "defies our conception of nature", and therefore there is good reason, he states, to expect a sense of awe to emerge any time an object "refuses to be grouped . . . with any set of objects".[346] In other words, it should not surprise us that wonder plays such a key role in belief systems. More surprising, perhaps, is its presence, indeed its prominent place, in the technological era of modernity. As such, it emerges in historical source material documenting experiences with novel technologies. Therefore, we would argue that, if anything, technical devices – standing outside of nature and functioning "contrary to our knowledge of nature" – may easily strike first-time or early users as miraculous or awesome. No less than the miracles Augustine is talking about, novel technologies strike one in first contact as "mysterious, inexplicable, baffling, unexpected, astonishing, and impossible".[347] As cognitivists argue, a sense of the miraculous "may occur when [and because] something violates our standing categories".[348] But this surely does

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344 Augustine, *The City of God*, vol. 21 (New York: The Modem Library, 1950), 8.

345 Augustine, *The City of God*, vol. 21, 8.

346 Carroll cited in Adam Smith, "History of Astronomy," in *Essays on Philosophical Subjects*, ed. I. S. Ross (Indianapolis: Liberty Classics, 1982), 39.

347 Carroll, "The Grotesque Today," 307.

348 The moment of confusion / speechlessness has been discussed in theories of the sublime as well as in theories of the grotesque, from Kant (on the sublime) to Kayser (on the grotesque). Interestingly, Carroll's reflection on awe is part of his study of the grotesque; this particular part on awe is triggered by the question of whether violations of the biological and ontological categories, so typical for the grotesque, can trigger positive, affirmative emotions. His answer to this question is *yes*; but as we can see if only we look at the point under discussion, interesting "family relations" do exist between the emotions discussed, as Carroll indeed argues in this study. Noteworthy is that Carroll does not pay much attention to the moment of confusion or speechlessness in his analysis.

not mean that just any violation of the cognitive categories triggers a sense of awe, as Carroll points out. Cognitive violations typically come with an amount of confusion, potentially marked by a moment of speechlessness and followed by an interval of vivid inquisitiveness. Yet Carroll argues that "the experience of awe is not just one of curiosity"; crucial is that the relation to the object in this object-focused experience is also and positively "appreciative". "It is an *object-absorbed experience* that combines our sense of its unlikelihood with an acceptance of it, no matter how much it deviates from our standing biological and ontological categories".[349] The object is embraced and affirmed as an "object of awe", and it is accompanied by a "feeling of exultation and expansion in both mind and body". As we "dwell on the diversity of the phenomenal world, [. . .] our body takes in the air needed to replace the breath that has just been taken away".[350] In other words, an object that triggers awe is being perceived as a violation of our natural order, a "transgression of our categorical frameworks", and as "inexplicable" – yet "for all that, accepted [. . .] rather than rejected" as it is "unthreatening".[351] Interestingly, such experiences have also attracted the attention of scholars in the fields of art history, aesthetics, and theory of history, and they have been discussed under different labels, among them the sublime, and as a heightened sense awareness of *presence*. Early cinema historians developed a keen interest in the way this phenomenon played out in historical sources of interest to film historians.[352]

We embrace the moment of confusion in experimental media research as a rich source of the creation of "sensationalized knowledge",[353] and as an exquisite entry point to the study of the material, perceptual, sensorial, performative, and experiential dimensions, which, as we have argued, are under-studied in media history so far.[354]

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349 Carroll, 307; our italics. Carroll is drawing from R. W. Hepburn's essay "Wonder," published in his collection *Wonder and Other Essays* (Edinburgh: Edinburgh University Press, 1984), 131–54.
350 Caroll, 307.
351 Caroll, 309.
352 For a reflection on the merits for historians, see Frank Ankersmit, *Sublime Historical Experience* (Stanford, CA: Stanford University Press, 2005); for an overview of the discussion and the value of the term for early cinema studies, see Gert Jan Harkema, *Aesthetic Experiences of Presence. Case Studies in Film Exhibition, 1896–1898.* (Stockholm: Stockholm University, 2019).
353 See Stafford, *Artful Science.*
354 Stafford, *Artful Science.*

The bodily sensation of interacting with "dead"[355] media in a real-life modus of hands-on experimentation, we claim, is very likely to change the way we "look" at the past. Experimenting with either original objects or replicas changes the way we will afterwards "read" or "interpret" the "traditional" sources for studying past media practices, such as manuals, advertisements, patents, etc. Experimentation will, in other words, enrich the interpretative repertoire of historians and thereby impact the hermeneutic process of making sense of the past in the present.

The multi-sensorial[356] and hands-on mode of historical learning has important pedagogical implications – among which the experience of failure is a potentially powerful heuristic experience too.[357] We came to understand that an experiment – any experiment – might be productive in terms of knowledge production, whether it succeeded or failed in terms of setup and expectations. Failures, too, make for useful case material for education and research, as they force new questions upon us. As many of the contributions to the edited volume *Pastplay: Teaching and Learning History with Technology* show, playfulness is key when it comes to triggering historical curiosity.[358] University education should not be a "memorization marathon",[359] but rather a place for "learning to fail better" – as Samuel Beckett famously stated:

> First the body. No. First the place. No. First both. Now either. Now the other. Sick of the either try the other. Sick of it back sick of the either. So on. Somehow on. Till sick of both. Throw up and go. Where neither. Till sick of there. Throw up and back. The body again. Where none. The place again. Where none. Try again. Fail again. Better again. Or better

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355 An interesting source on what they call dead media (in line with Bruce Sterling), but also "zombie media" is Garnet Hertz and Jussi Parikka, "Zombie Media: Circuit Bending Media Archaeology into an Art Method," *Leonardo* 45, no. 5 (2012): 424–430. See also the "dead media revival" Patrick Ellis encourages as a "way to have students engage with old media by remaking them with new technologies" (Ellis and Williamson "Object Lessons, Old and New," 9). Very relevant here too is the "undead media project", run by Andrea Mariani from the University of Udine: https://andreamariani.info/undead-media-project/ [last accessed 26.07.2022]. See also the "Dead Media Project" run by Tom Jennings: http://www.deadmedia.org/ [last accessed 26.07.2022].

356 On a discussion of the multi-sensorial within the context of the museum, see Nina Levent and Alvaro Pascual-Leone, eds., "Introduction," *The Multisensory Museum: Cross-Disciplinary Perspectives on Touch, Sound, Smell, Memory, and Space* (Lanham: Rowman and Littlefield, 2014), xiii–xxvi. See also Jamie Ward, "Multisensory Memories: How Richer Experiences Facilitate Remembering," in *The Multisensory Museum*, 273–284, and Juhani Pallasmaa, "The Museum as an Embodied Experience," in *The Multisensory Museum*, 239–250.

357 For a thoughtful reflection on "failure" as mode of "thinking in the making", see Stuart Firestein, *Failure. Why Science Is So Successful* (Oxford: Oxford University Press, 2016).

358 Kee, ed., *Pastplay*.

359 Firestein, *Failure*, 36.

worse. Fail worse again. Still worse again. Till sick for good. Throw up for good. Go for good. Where neither for good. Good and all.[360]

Despite the fact that it is a commonplace to state that we learn more from our mistakes than we do from our successes, teaching history is rarely about encouraging students to fail![361] Yet this has been at the heart of Tim Ingold's approach in his "4 A" courses on "Anthropology, Archaeology, Art and Architecture", which he designed for advanced undergraduate and postgraduate students in the social anthropology program at the University of Aberdeen, which ultimately led to the publication of the book *Making* in 2013.[362] The aims of the course were

> to train students in the art of inquiry, to sharpen their powers of observation, and to encourage them to think *through* observation rather than *after* it. Like hunters they had to learn how to follow the movements of beings and things and, in turn, respond to them with judgement and precision. They would discover that the path to wisdom lay in this correspondence, not in an escape into the self-referential domain of academic texts.[363]

In line with Söhnke Ahrens' observations, we argue that knowledge has the tendency to be quickly forgotten and that only experimental forms of learning transform knowledge into literacy (*Bildung* in German), or wisdom in Ingold's sense.[364] *Bildung* is a word that, to some, comes with nineteenth-century connotations of a European bourgeois education with some imperial and colonial overtones. This certainly is not what we have in mind, nor Ahrens for that matter. We would rather embrace Sarah Ahmed's feminist view on the affirmative potential of education. In line with Bruno Latour's 2004 plea for the end of a "critique on critique" phase,[365] Ahmed has been pleading for something much more positive, affirmative and energising.[366]

A heart-warming plea for an affirmative and hands-on approach to learning as an "eye-opening occupation" in the service of an interrogation of "human ascriptions and assumptions" and of "finding ways to recognize and love difference" is also to be found in Helen MacDonald's *Vesper Flights*, with which we

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360 Samuel Beckett, "Worstward Ho," in *Nohow On* (London: John Calder, 1989), 110.

361 Mills Kelly, "True Facts or False Facts – Which Are More Authentic?" in *Pastplay*, ed. Kee, 309–327.

362 Ingold, *Making*, 11.

363 Ingold, *Making*, 11.

364 Sönke Ahrens, *Experiment und Exploration*, 17–21, 266–275; see Chapter 2.

365 Bruno Latour, "Why Has Critique Run out of Steam? From Matters of Fact to Matters of Concern," *Critical Inquiry* 30 (2004): 225–248.

366 See Sarah Ahmed's review of "Object Lessons," by Robyn Wiegman, *Feminist Theory* 13, no. 3 (2012): 345–354. Note that Ahmed, as is Wiegman, is not speaking about material objects but about ways of constructing the epistemic object (e.g., in negative or affirmative ways).

Fig. 23: Studying / decoding a circuit diagram with the retired Luxembourgish PTT engineer Albert Wolter during the "Radio Repair Café" at the Digital History Lab / University of Luxembourg. The workshop was organised in the framework of the FNR-funded project "Repairing Technology – Fixing Society" in February 2020. Photo by Andreas Fickers. Courtesy of the C²DH / University of Luxembourg.

opened this book.[367] As a curator, she is keenly aware of the knowledge of the world we only have access to with our hands, hence she embraces the sensory experience with the eclectic collections of objects found in Cabinets of Wonder for good reasons. Wonder (awe, astonishment) is affirmative and it is at the heart of all these experiences. Wonder, as opposed to such emotions as horror, repulsion or laughter, typically has an affirmative quality and its effects on the cognitive process are positive and world embracing.[368] These qualities are pivotal to the practice of hands-on experimentation with old media technologies in academic teaching. The practice has a great potential, not yet fully realised, in a variety of fields such as history, media history, film and media studies,

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367 MacDonald, *Vesper Flights*, 2020, viii.
368 On the affirmative qualities of wonder and its effects on the cognitive process, see the cognitivist film scholar Noël Carroll, "The Grotesque Today," 291–311.

museology, performance studies, archaeology, musicology, cultural anthropology and ethnography. Of course, some universities have already established "Media Labs" for hands-on experimentation, and the *Lab Book* made by Lori Emerson and Jussi Parikka is especially informative in this regard, as is the Introduction to their special issue by Doron Galili and Erkki Huhtamo.[369] Some Departments have been hosting important collections of media artefacts[370] that are integrated into their teaching activities.[371] However, thus far, we lack clear practical instructions or best practice guidelines on how to do this in a pedagogically sound and technically safe way.[372]

5.5 Conclusion

As so many studies have shown, wonder plays a prominent role in the history of media. However, none of the sources referred to so far in this chapter suggests that wonder is the most important emotion awoken, let alone the only emotion emerging in historical practices of media use. It seems to us, however, that wonder does stand out in the history of media in several ways:

– wonder is part of a spectrum of emotions that typically have an affirmative quality (as awe and astonishment), meaning that the effects on the cognitive process are positive and affirmative;

– the use of devices of wonder is therefore attractive to users who state that such feelings affect the user experience in a positive way, as so many historical sources have testified; wonder (awe, astonishment) is a topos in reception histories;

– framing the envisioned use of technological novelties within a so-called discourse of wonder is a recurring phenomenon in media history;[373] moreover, there are good reasons to assume that such discourses of wonder strengthen

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369 See the "Media Lab" at Boulder / Colorado. See also Darren Wershler, Lori Emerson, and Jussi Parikka, *Lab Book. Situated Practices in Media Studies* (Minneapolis: University of Minnesota Press, 2022). They discuss a great collection of laboratories in our field of studies as fundamentally connected to changes in the contemporary university.

370 See, for instance, the discussion of the specific use of a Film Archive and Media Archaeology Lab embedded, solely for purposes of education and research, in a university (the University of Groningen), in Fossati and Van den Oever, "Introduction," *Exposing the Film Apparatus.*

371 The 2020 special issue of *Early Popular Visual Culture* offers recent discussions of a variety of teaching practices with (early) media devices, optical toys, etc.

372 This is of course the very aim of volume 2 of this book project.

373 Huhtamo, "From Kaleidoscomaniac to Cybernerd."

the user experience, e.g., by helping to articulate it in a variety of affirmative wordings;
- although wonder, as an emotion emerging in historical media practices, has been studied to a fair degree, cycles of wonder and what we have called cycles of sensitization and desensitisation (SDCs) have gone unstudied, with few exceptions; they need more attention in research to analyse and clarify the historical processes of media adaptation, acceptance, standardisation, institutionalisation, etc;
- emotions such as horror, repulsion and laughter, which, unlike wonder, are *not* affirmative, have been part of historical practices of media use too, but they have been relatively little studied so far, in particular the emotions which, more narrowly, may arise with the technologies themselves (say, a revolting smell of a film reel affected by vinegar syndrome, a projector that makes a nagging sound, a radio set which produces white noise, the low-quality signal of a 1950s television set).

At the end of this chapter, we will draw some extra attention to this last point because there is good reason to assume that the less affirmative emotions do also play a role in historical media practices,[374] and also in media experiments, for that matter. The question then is how to observe (in the case of experiments), assess, and understand such emotions which involve "an element of rejection".[375] And how relevant is this to historical research?

Carroll has convincingly argued that laughter "like horrific disgust, involves an element of rejection" and that we want to "expel the disgusting from our bodies. Laughter, too, is a gesture of expulsion". Even when we are "*taking pleasure in the absurd*, we resist it bodily, casting it out, so to speak, in bursts of laughter – bursts of breath expelled away from us".[376] Interestingly, Carroll argues that "family relations" exist between these emotions (e.g., awe, horror, disgust, and laughter / comic amusement), thus making it more plausible that users can indeed swiftly and suddenly shift from embracing a medium to rejecting it.[377]

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374 For reflections on these emotions within the context of early cinema, see Marina Dahlquist, Doron Galili, Jan Olsson and Valentine Robert, eds., *Corporeality in Early Cinema: Viscera, Skin, and Physical Form*, Series Early Cinema in Review: Proceedings of Domitor (Bloomington: Indiana University Press, 2018).

375 Carroll, "The Grotesque Today," 308.

376 Carroll, "The Grotesque Today," 308; our italics.

377 Gunning focuses rather on the impact on the imagination and points at the way negative emotions, discussed under the broader label of the uncanny as analysed by Freud, revive "primitive beliefs" and magical and superstitious ideas which, according to Freud, "remained preserved under a thin disguise." Cited in Gunning, "Re-Newing Old Technologies," 47.

Of special interest to EMA is that all these emotions are notable and can be observed and recorded during experimentation and thus be analysed post factum. The question is how they can be explained in terms of the material, technical, and performative make-up of the media that seem to cue them. Can we actually observe users experiencing (media) technologies themselves as "unnatural", coming to them from beyond nature or "contrary to nature" (cf. Augustine)?[378] Yet, interestingly, these technologies do tend to become "second nature" (Gunning) in the end. Can we actually observe such cycles (of wonder) in historical source material?

"Any sufficiently advanced technology is indistinguishable from magic", as Arthur C. Clarke wrote.[379] He realised that any (major) technology at its moment of arrival in our lives is basically *unimaginable* to us. Face to face with it, we fail to imagine its workings, its function, its potential, its long-term impact on culture. Clarke famously discussed the problem under the title "Hazards of Prophecy: The Failure of Imagination".[380] On the basis of the theories of wonder just discussed here, there is good reason to see major technologies (such as the train, the plane, the elevator, the telephone, radio and television, the computer and the cell phone) coming to us as "miracles" which create awe but also a sense of confusion, and need some time before their *magic* starts unfolding. It is important for researchers to realise that it takes time for technologies to unfold their impact on the user's imagination; to resonate in public debate; and to find their way into historical source material explicitly.[381] Virginia Woolf's famous 1928 observation in *Orlando* is illustrative of the sense of awareness of the magic of such technological revolutions as the lift, the telephone, the radio and airplanes:

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378 We are using the word "unnatural" here in the sense of "not part of nature", but we are aware of its connotations and also that, potentially, a post-colonial/decolonial discussion may emerge out of this question, one in which the "unnatural" could be read as "foreign" or "coming from the colonial masters' culture". This resonates in various contexts, from the representative of the Irish Film Archives at the Lausanne FIAF Conference in 2019 claiming that, to the Irish, cinema has remained a medium perceived as coming from the outside, and to various Indigenous filmmakers around the world having to construct their own, specific relations with that Western medium called film.

379 Arthur C. Clarke, "Hazards of Prophecy: The Failure of Imagination" in the collection *Profiles of the Future: An Enquiry into the Limits of the Possible* (London: Gollancz, 1962, rev. 1973), 14, 21, 36. Clarke is a British science fiction writer, well trained in envisioning technological futures, as Siegfried Zielinski would call them, and the sci-fi genre is indeed a wonderful source for media archaeologists.

380 Clarke, "Hazards of Prophecy: The Failure of Imagination," in the collection *Profile of the Future: An Enquiry into the Limits of the Possible* (London: Gollancz, 1962, rev. 1973).

381 Tsivian's study of the cultural reception of early cinema in Russia presents a model worth studying in these terms (Tsivian, *Early Cinema in Russia*).

> Then she got into the lift [. . .] and was shot smoothly upwards. The very fabric of life now, she thought as she rose, is magic. In the eighteenth century, we knew how everything was done; but here I rise through the air; I listen to voices in America; I see men flying – but how it's done I can't even begin to wonder. So my belief in magic returns.[382]

Experiences of the magic of technologies do leave traces in historical source material. We assume that some historical traces of such cyclically re-emerging media experiences, and the user practices from which they emerge, can be excavated in an archaeology of media and cultures.[383]

The merit of media-archaeological excavations of dead media, and their now forgotten "possible futures"[384] and historical practices of use, may well be that they bring back to us an acute sense of how deeply media affect cultures, and how the histories of major media technologies, moving between moments of awe and angst, are part of the history of the wondrous. Experiments may bring back to us a taste of such magic media moments with a strong sensorial, imaginative and experiential value. For EMA, the experimental support to such excavations and the study of historical source material implies more reflection on their impact on the historical imagination, and more experimental, trial and error research into the best ways in which to observe, record, and analyse the sensorial and experiential dimensions present in user behaviour during experiments. What to prioritize? How to assess the experiences in a phenomenologically rich way? How to analyse these

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382 Virginia Woolf, *Orlando: A Biography* (London: Hogarth Press, 1928).

383 Research in this field would be covered by Erkki Huhtamo's topos study as a method of media archaeological analysis, proposed by him in his "From Kaleidoscomaniac to Cybernerd," 296–303, 425–27. In his book with Jussi Parikka, Huhtamo later added that though some suggested "translating *Toposforschung* as topology, but I have chosen to use topos study to avoid confusion with the many other uses of the word topology" (Huhtamo and Parikka, *Media Archaeology*, 42 (note 10).

384 We prefer the term "forgotten futures", as it signifies the specific status of such envisionings of futures that never materialised but were imagined at one point in time, in a past we have forgotten about too. However, such "forgotten futures" form interesting material for an archaeology of media, potentially offering new insights into the imaginary users and practices of use envisioned at a particular point in time and forgotten afterwards. The term used by Thomas Elsaesser is "Imagined Futures"; in a chapter on a research project by that name he discusses such futures (Elsaesser, "Between Knowing and Believing. The Cinematic Dispositive after Cinema," in: *Cine-Dispositives Essays in Epistemology Across Media*, AUP book series Film Culture in Transition, eds. Maria Tortajada and François Albera: doi.org/10.1515/9789048523443. Elsaesser also speaks of "possible futures". See Wanda Strauven, "Media Archaeology." See also Thomas Elsaesser, "The New Film History as Media Archaeology."

phenomena in relation to material media technologies and re-doings of historical users' practices? How to best recognize them in historical source material?[385]

As to teaching: if one thing became overwhelmingly clear in the assessment driving this past chapter, it was that awe and wonder, as well as emotions in the same spectrum, such as astonishment, are at the heart of many sensorial experiences created with media technologies. Such a distinctly positive, affirmative emotion is pivotal to the practice of hands-on experimentation with old media technologies in academic teaching. It has great potential, not yet fully realised in academia, to warm students to academic learning, and to open them up to philosophical thinking and an inquiry into historical practices of media use. As such, it offers a particularly relevant opening to the study of the material and sensorial dimensions of media history.

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385 Since so many studies in the field of film and media history provide detailed discussions of historical examples, revisiting studies by Yuri Tsivian and so many others seems imperative, as they represent a treasure trove for future research.

Conclusions

The preceding chapters represent the outcomes of a journey into unknown territory, an adventure that "brought us places" we had not envisioned in advance. We were "randonneurs" in Michel Serres' sense, willing to take the risk of getting lost and wandering in circles.[386] In many ways, it was also a *passage* for us both, taking us from one state of thinking about research into another way of thinking about *doing* research. In retrospect, it is clear to us that, all along, we have been looking for answers to the question why and how hands-on experiments with material objects help us gain knowledge about past media practices. We came to realise that archive-driven experiments with historical devices, hands-on, could give insight into the sensorial dimensions of past historical media practices.

We are grateful that we have been able to discuss our work at length with esteemed colleagues such as Erkki Huhtamo, Lori Emerson, John Ellis and Martin Loiperdinger, who were crucial to our project as a critical soundboard. In addition, we have taken inspiration from the theoretical and practical insights available to us from archive-driven and archaeological practices found in early cinema studies, art history, experimental archaeology, musicology, new media studies and media art experiments,[387] all of which have provided inspiring examples of experimental practices of *doing* history. Yet at the heart of our reflections were a range of experiments by ourselves and close colleagues.[388]

However, it was also clear that as yet no set research practices existed for the historical disciplines and that the sciences have what we have not: set research paradigms and schools and, by implication, developed research and laboratory practices, with set procedures and protocols. In contrast, designing and doing hands-on experiments with material objects to gain knowledge from the "things" studied was largely – though not fully – new to media history. Unfortunately, the sciences, in our experience, do not provide ready models for the design of the

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386 Michel Serres, *The Five Senses. A Philosophy of Mingled Bodies* (London: Continuum, 2008).

387 See for instance Lori Emerson's and Jussi Parikka's *Lab Book*, and the special issue of Early Popular Visual Culture devoted to hands-on experiments used in teaching practices: Ellis and Williamson, "Object Lessons, Old and New." Very interesting to us also are the artist-run media archaeological experiments executed by well-known artists such as David Hockney and William Kentridge.

388 For example, the experiments run by the Luxembourg DEMA group (Aleksander Kolkowski, Tim van der Heijden, Stefan Krebs and Andreas Fickers), the team of the Groningen Film Archive & Media Archaeology Lab (Bernd Warnders, André Rosendaal, Eva de Jong, Nynke Bruinsma, Annie van den Oever, and the late Johan Stadtman), but also experiments designed and run by John Ellis, Nick Hall, Erkki Huhtamo, Lori Emerson, Jussi Parikka, Ludwig and Karin Vogel-Bienek, Ben Roberts, Mark Goodall, Wanda Strauven, and Alexandra Schneider.

hands-on experiments we need to suit the humanities' research strategies and purposes identified by us in this book. Rheinberger is one of the rare history of science experts who takes an interest in this type of problem. In that respect, his reflections on knowledge creation by "thinking with our hands" have been of great inspiration to us.[389] These concluding remarks aim to address the impact of such experiments on our historical imagination and their value for research and education in the historical disciplines.

Clearly, the practices of re-using (a term often used by curators), re-doing, re-enacting, re-working, or replicating – practices we set up within the experimental framework – aim not only at serving historical research interests in past media practices and performances, but are also inspired by and part of a larger educational and pedagogical discourse about historical learning. As we have stated on several occasions already, we promote doing hands-on history in the field of experimental media archaeology as a critical research method, going against the ahistorical searches for "authentic experiences of the past", which are put forward by the tourist and heritage industries and which – in the words of Mark Smith – "wrongly marry the production of the past to its present-day consumption".[390] As opposed to these practices, we propose forms of hands-on experimentation which support a self-reflexive approach to historical knowledge production and highlight the contemporary situatedness of the historian-experimenter. If anything, the experimental practices we propose aim at emphasising the need for critical reflection on the concepts of historical authenticity, accuracy, experience, and imagination.

Vanessa Agnew has pointed out that "it is the very ahistoricity of re-enactment that is the precondition for its engagement with the historical subject matter".[391] The principal need for historical distance for producing historical knowledge has been emphasised by many philosophers of history, probably most systematically in the work by the French philosopher Paul Ricoeur.[392] But, despite the many convincing philosophical demonstrations of the impossibility of creating an unmediated and synchronous experience of the past, the desire to come "closer to the past" nevertheless remains inscribed into any historical research. This desire was already apparent in the Romantic period, when writers and philosophers used the concept of a "historical experience" or "historical event" to express their desire for

389 Hans-Jörg Rheinberger, "Mit den Händen denken. Im Gespräch mit Heiko Roehl," in *Experimentalität. Hans-Jörg Rheinberger im Gespräch über Labor, Atelier und Archiv* (Berlin: Kadmos, 2018), 228–236.

390 Smith, S*ensing the Past*, 121.

391 Vanessa Agnew, "What is Re-enactment?" *Criticism* 46, no. 3 (2004): 328.

392 Paul Ricoeur, *Time and Narrative* (Chicago: Chicago University Press, 1984).

an authentic experience of the past.[393] As the Dutch theorist of history Frank Ankersmit has shown in his monumental study *Sublime Historical Experience,* the reflections of Johan Huizinga on the history of civilisation, no less than the concept of "re-enactment" of the British historical philosopher R. G. Collingwood, are imbued with these romantic visions of the possibility of a sublime perception of history.[394]

The mindful and sensorial engagement with past media technologies that we promote is rather meant to provoke "imaginative speculations" about how things might have looked, or felt, or sounded like in the past – in the full awareness that the reproducibility of that past itself is by definition beyond recovery. As the historian of the senses Mark Smith has argued:

> While it is perfectly possible to recreate the decibel level and tone of a hammer hitting an anvil from the nineteenth century, or a piece of music from 1750 (especially if we still have the score and original instruments), or the taste of a given food from 1100, or the smell of dung from 1500 (I imagine that, chemically, the reproduction is feasible), it is impossible to experience those sensations in the same way as those who heard the hammer or music, tasted the food, or smelled the dung. (. . .) The same holds true for all historical evidence, visual and aural included.[395]

One reason why the desire to come closer to the past remains so pervasive when dealing with old media technologies might originate in the fact that media technologies have often served as metaphors for historical knowledge *tout court*. As Ivan Ross has demonstrated, historical paintings, photographs, or films have all served as metaphors for history being defined as "photorealistic", "cinematic", or "panoramic".[396] To Ross, "the popular media technologies of an era might go so far as to determine the very bounds of that era's

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393 C. Zwink, *Imagination und Repräsentation. Die theoretische Formierung der Historiographie im späten 17. und frühen 18. Jahrhundert in Frankreich* (Tübingen: Niemeyer, 2006); Collingwood, *The Idea of History*.

394 Frank Ankersmit, *De sublieme historische ervaring* (Groningen: Historische Uitgeverij, 2007). This is the reworked version of *Sublime Historical Experience*, which was written in English and published two years earlier in the book series Cultural Memory in the Past, edited by Mieke Bal and Hent de Vries. Ankersmit himself, however, pays little attention to the senses and how historical experiences are affected by them.

395 Smith, *Sensing the past*, 121.

396 Ivan Ross, "Iterative Interactions," 207–231. Siegfried Krakauer was probably the first to use the metaphor of film / cinema as a model for a theory of history, reflecting on the specific indexical relationship that link moving images to the recorded reality and the narrative conventions and techniques that turn a film into a powerful narration able to play with multiple perspectives, temporalities, and emotional regimes (Krakauer, *Geschichte – Von den letzten Dingen*, Frankfurt am Main: Suhrkamp, 1971).

reflection of what history is".[397] Although we would be more cautious here – the nineteenth and twentieth centuries saw many more metaphors to capture the very idea of what history constitutes – Ross has a point when reminding us of the strong impact that media technologies have had on our historical imagination. "The historical imagination", Ross writes, "inflected visual literacy and pictorial technique, just as visual literacy and pictorial technique inflected the evolution of historical imagination".[398] Photorealistic images as much as captured sounds on wax cylinders or magnetic tapes evoke a specific *Vergangenheitseffekt*, which makes us feel closer to the past.[399]

While the past remains a "foreign country"[400] that cannot be revisited, history – as the mediated representation, narration, and interpretation of that absence – has to critically reflect on the situatedness of historical knowledge production, and to think about the question of what "historically informed" or "historically appropriated" practices of knowledge production actually mean. By carefully documenting the research and reflection process, moreover, and by describing the experimental setting and defining the modes of experimentation as we propose here, we aim to give shape to experimental media archaeology as a form of historical knowledge production that subscribes to the hermeneutic principles of what Joyce Appleby called "qualified objectivity".[401] She coined the term to pay tribute to "the subjectivity of those who study history" and, furthermore, to acknowledge "the existence of objective traces of the past that constrain what the historian can say: the past is indeed present in texts and material remains, though it cannot dictate 'history', which is inevitably shaped by those who write it".[402] We cannot but agree that experimentation in our field of studies changes the relation of the research-experimenter to the past. In our experience, experimentation makes one inquisitive, and thus reshapes the past as an object-under-scrutiny; it is framed in new ways as an object of inquiry. It also reshapes the relation to the written sources, whose status and content are being questioned from new angles. In this way, experimentation not only affects and re-

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397 Ivan Ross, "Iterative Interactions," 210.

398 Ivan Ross, "Iterative Interactions," 218.

399 Peter Greimer, *Die Farben der Vergangenheit. Wie Geschichte zu Bildern wird* (München: Beck, 2022).

400 David Lowenthal, *The Past is a Foreign Country* (Cambridge: Cambridge University Press, 1986).

401 Joyce Appleby et al., *Telling the Truth about History* (New York: Norton, 1994).

402 Sarah Maza, *Thinking about History* (Chicago: University of Chicago Press, 2018), 224.

shapes the repertoire of heuristic tools, but also the questions driving such a re-search project and our "imaginative engagement"[403] with the past.

Last but not least, the "iterative interactions" (Ross) with objects from the past, situated within an experimental setting of historical knowledge produc-tion, can teach us something about the emotional relationship that every histo-rian entertains with his or her object of study. In this way, the "laboratories" of experimental media archaeology – just as "archives" and "libraries" in general do – become specific places of historical practice filled with "taste" (Alette Farge),[404] surrounded by an aura of hidden treasures and potential discoveries, and memories of great hopes and frustrations.[405] In fact, the places in which we have been able to do experiments – be it the laboratory, the museum depot, the filled cabinet of an amateur collector, or the auditorium prepared for the performance lecture – are all turned into highly emotional spaces when practis-ing our method of historical knowledge production. As Francoise Waquet has demonstrated, archives, libraries, and "on site laboratories" for historical field research become "emotional spaces of knowledge production", where histori-ans interact with highly affective epistemological objects.[406] This emotional re-lationship is hardly ever mentioned in the scientific publications that emanate from the doing of history in these emotional spaces, yet we find ample traces of emotional reactions, such as frustration, surprise, wonder, boredom, fatigue, or epiphany, in field notes, lab books, and audio-visual "documentary evidence". As such, field notes and other recordings of experiments in media archaeology can inform us about the production of embodied knowledge about the past. It sensitises us to the intrinsic relationship between historical sensemaking and emotional reasoning, affective perception and phenomenological reflection. Doing experimental media archaeology and reflecting on it therefore creates, we believe, a creative and fruitful new terrain for questioning the past and for advancing the making of historical knowledge.

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403 John Tosh, *The Pursuit of History. Aims, Methods and New Directions in the Study of the Past* (London: Routledge, 2016), 1757.

404 Arlette Farge, *Le goût de l'archive* (Paris: Éditions Points, 1997).

405 See also Achim Landwehr, *Die anwesende Abwesenheit der Vergangenheit: Essay zur Ge-schichtstheorie* (Frankfurt am Main: S. Fischer, 2016).

406 Francoise Waquet, *Une histoire émotionelle du savoir. XVIIe – XXIe siècle* (Paris: CNRS Éd-itions, 2019).

Bibliography

Aasman, Susan. "Home Movies: A New Technology, a New Duty, a New Cultural Practice." In *Private Eyes and the Public Gaze: The Manipulation and Valorization of Amateur Images*, edited by Sonja Kmec and Viviane Thill, 45–51. Trier: Kliomedia, 2009.

Aasman, Susan. "New Media Technologies and the Desire to Broadcast Yourself." In *Retelling Journalism: Conveying Stories in the Digital Age*, edited by Marcel Broersma and Chris Peters, 47–64. Leuven: Peeters, 2014.

Aasman, Susan. Staging the Amateur Film Dispositif. A Report. 2014. [Online] https://homemoviesproject.wordpress.com/report-staging-the-amateur-dispositif/ [last accessed 26.07.2022].

Ahrendt, H. "Introduction." In *Illuminations: Essays and Reflections*. New York: Schocken Books, 1968, 1–58.

Ahrens, Sönke. *Experiment und Exploration. Bildung als experimentelle Form der Welterschließung*. Bielefeld: Transcript Verlag, 2011.

Ahrens, Sönke. *How To Take Smart Notes. One Simple Technique to Boost Writing, Learning and Thinking – for Students, Academics and Nonfiction Book Writers*. Warsaw: Create Space, 2017.

Akrich, M. and B. Latour. "A Summary of a Convenient Vocabulary for the Semiotics of Human and Nonhuman Assemblies." In *Shaping Technology, Building Society: Studies in Sociotechnical Change*, edited by E. Bijker and J. Law, 259–264. Cambridge: MIT Press, 1992.

Albera, François, and Maria Tortajada, eds. "Introduction to an Epistemology of Viewing and Listening Dispositives." In *Cinema Beyond Film: Media Epistemology in the Modern Era*, 9–22. Amsterdam: Amsterdam University Press, 2010.

Allard, Laurence. *Mythologie du portable*. Paris: Le Cavalier Bleu, 2009.

Allard, Laurence. "Express Yourself 3.0! Le mobile comme technologie pour soi et quelques autres entre double agir communicationnel et continuum disjonctif soma-technologique." In *Téléphone mobile et création*. Paris: A. Colin, 2014.

Altman, Rick. "Toward a Theory of the History of Representational Technologies." *Iris* 2, no. 2 (1984): 111–125.

Altman, Rick, ed. "General Introduction: Cinema as Event." In *Sound Theory/Sound Practice*. New York: Routledge, 1992.

Altman, Rick. *Silent Film Sound*. New York: Columbia University Press, 2004.

Altman, Rick. "Cue sheets." In *Encyclopedia of Early Cinema*, edited by Richard Able, 229–230. Abingdon: Routledge, 2005.

André, Emmanuelle, and Dork Zabunyan. *L'attrait du téléphone*. Crisnée, Belgium: Yellow Now, 2013.

Andrew, Dudley. *What Cinema Is!* Oxford: Wiley-Blackwell, 2010.

Ankersmit, Frank. *Sublime Historical Experience*. Stanford, CA: Stanford University Press, 2005.

Appleby, Joyce, Lynn Hunt and Margaret Jacob. *Telling the Truth about History*. New York: Norton, 1994.

Arlo, Raymond. "Media Ecology." *Radical Software* 1, no. 3 (1971): 19.

Arnheim, Rudolf. *Film as Art*. [*Film als Kunst*, 1932.] Los Angeles: University of California Press, 1957.

Arnheim, Rudolf. Systematik der fruhen kinematographischen Erfindungen. In *Kritiken und Aufsatze zum Film*, edited by H. H. Dietrichs. Munich: Carl Hanser Verlag, 1977.

Arnheim, Rudolf. "The Sad Future of Film" [1930]. In *Film Essays and Criticism*, 11–13. Madison, WI: University of Wisconsin Press, 1997.

Arnheim, Rudolf. "The Coming and Going of Images." [Editorial.] *Leonardo* 33, no. 3 (2000): 167–168.

Arnheim, Rudolf. *Art and Visual Perception: A Psychology of the Creative Eye*. Los Angeles: University of California Press, 2004.

Arnheim, Rudolf. "LEONARDO/ISAST CALL FOR PAPERS: Refresh! First International Conference on the Histories of Media Art, Science and Technology" [2000]. *Leonardo On-Line* (December 2004). [Online] http://www.leonardo.info/isast/journal/calls/arthistory_re freshcall2004.html [last accessed 26.07.2022].

Arrigoni, Gabriella. "Innovation, Collaboration, Education: Histories and Perspectives on Living Labs." In *xCoAx2013*: *Proceedings of the First Conference on Computation Communication Aesthetics and X, Bergamo, 2013*, 215–224. Porto: Universidade do Porto, 2013.

Arvidson, Linda. *When the Movies Were Young* [1925]. New York: Dover Publications, 1969.

Bachelard, Gaston. *Poetics of Space*. Boston: Beacon Press, 1969.

Bachelard, Gaston. *Die Bildung des wissenschaftlichen Geistes. Beitrag zu einer Psychoanalyse der objektiven Erkenntnis*. Frankfurt am Main: Suhrkamp, 1978.

Bachelard, Gaston, *Poetik des Raumes*. Frankfurt am Main: Fischer Verlag, 1987.

Balázs, Béla. "Visible Man, or the Culture of Film." *Screen* 48, no. 1 (2007): 91–108.

Balázs, Béla. *Early Film Theory. Visible Man and The Spirit of Film* [1924/1930]. Translated by Rodney Livingstone. Edited by Erica Carter. New York: Berghahn Books, 2010.

Balsom, Erika. "Around The Clock: Museum and Market." *Framework: The Journal of Cinema and Media* 54, no. 2 (2013): 177–191.

Balsom, Erika. *Exhibiting Cinema in Contemporary Art*. Amsterdam: Amsterdam University Press, 2013.

Balsom, Erika. "Original Copies: How Film and Video Became Art Objects." *Cinema Journal* 53, no. 1 (Fall 2013): 97–118.

Barnard, Timothy. "'The 'Machine Operator': Deus Ex Machina of the Storefront Cinema." *Framework* 43, no. 1 (2002): 40–75.

Baron, Jaimie. *The Archive Effect: Found Footage and the Audiovisual Experience of History*. London: Routledge, 2014.

Barthes, Roland. *Camera Lucida: Reflections on Photography*. Translated by Richard Howard. New York: Hill & Wang, 1981.

Bateson, Gregory. *Steps to an Ecology of Mind*. [1972.] Chicago: Chicago University Press, 2000.

Baudry, Jean-Louis. "Le dispositif: approches métapsychologiques de límpression de la réalité." *Communications* 23, no. 23 (1975): 56–72. [Online] http://www.persee.fr/web/re vues/home/prescript/article/comm_0588-8018_1975_num_23_1_1348 [last accessed 26.07.2022].

Baudry, Jean-Louis. "The Apparatus: Metapsychological Approaches to the Impression of Reality in the Cinema." In *Narrative, Apparatus, Technology*, edited by Philip Rosen, 299–318. New York: Columbia University Press, 1986.

Bazerman, Charles, *The Language of Edison's Light*. Cambridge, MA: MIT Press, 1999.

Bazin, André. "Un nouveau stade du cinéma en relief: le relief en equations." *Radio, Cinéma, Télévision* 131 (20 July 1952). Republished in English: "A New Stage in the Process: Math Equations for 3D." In *André Bazin's New Media*, edited and translated by Dudley Andrew, 235–242. Oakland, CA: University of California Press, 2014.

Bazin, André. "La revolution par le relief n'a pas eu lieu." *Radio, Cinéma, Télévision*. 1 April 1956. Republished in English: "The 3D Revolution Did Not Take Place." In *André Bazin's New Media*, edited and translated by Dudley Andrew, 258–264. Oakland, CA: University of California Press, 2014.

Bazin, André. "The Ontology of the Photographic Image." *Film Quarterly* 8 (1960): 4–9.

Bazin, André. *What Is Cinema?* Vol. I. Berkeley, CA: University of California press, 1967.

Bazin, André. *What Is Cinema?* Vol. II. Berkeley, CA: University of California press, 2005.

Bellour, Raymond. "The Cinema Spectator: A Special Memoir." In *Audiences: Defining and Researching Screen Entertainment Reception*, edited by Ian Christie, 206–217. Amsterdam: Amsterdam University Press, 2012.

Bellour, Raymond. *La Querelle des dispositifs. Cinéma – installation, exposition*. Paris: P.O.L., 2012.

Belton, John. "CinemaScope and Historical Methodology." *Cinema Journal* 28, no. 1 (Fall 1988): 22–44.

Belton, John. *Widescreen Cinema*. Cambridge, MA: Harvard University Press, 1992.

Belton, John. "CinemaScope and the Widescreen Revolution." *Cinegrafie* 16 (2003): 244–253.

Bendix, Regina, and Donald Brenneis. "The Senses." *Etnofoor: Anthropological Journal* 18, no. 1 (2006).

Benjamin, Walter. The Work of Art in the Age of Mechanical Reproduction. [1935.] In *Illuminations: Essays and Reflections*, edited by Hannah Arendt, 217–252. New York: Schocken Books, 1968.

Bennett, Colin N. *The Handbook of Kinematography: The History, Theory, and Practice of Motion Photography and Projection*. London: The Kinematograph Weekly, 1913.

Beugnet, Martine. "Miniature Pleasures: On Watching Films on an iPhone." In *Cinematicity*, edited by Jeffrey Geiger and Karin Littau, 196–211. Edinburgh: Edinburgh University Press, 2014.

Bithell, Caroline, and Juniper Hill, eds. *The Oxford Handbook of Musical Revival* (Oxford: Oxford University Press, 2014).

Bolter, Jay David, and Richard Grusin. "Remediation." In *Configurations* 4, no. 3 (Fall 1996): 311–358. DOI: 10.1353/con.1996.0018.

Bolter, Jay David, and Richard Grusin. *Remediation: Understanding New Media*. Cambridge, MA: MIT Press, 1999.

Bolter, Jay David. "Remediation and the Language of New Media." *Northern Lights*: Film & Media Studies Yearbook 5, no. 1 (September 2007): 25–37. DOI: https://doi.org/10.1386/nl.5.1.25_1.

Bordwell, David. "CinemaScope: The Modern Miracle You See Without Glasses." In *Poetics of Cinema*, 281–325. New York: Routledge, 2007.

Bordwell, David. *Poetics of Cinema*. New York: Routledge, 2007.

Bordwell, David. *Pandora's Digital Box: Films, Files, and the Future of Movies*. Madison, WI: Irvington Way Institute Press, 2012.

Bordwell, David. "Pandora's Digital Box: From the Periphery to the Center, or the One of Many Centers." *Observations on Film Art* (blog). January 11, 2012. [Online] http://www.david

bordwell.net/blog/2012/01/11/pandoras-digital-box-from-the-periphery-to-the-center-or-the-one-of-many-centers/ [last accessed 26.07.2022].

Bordwell, David. "CinemaScope: The Modern Miracle You See Without Glasses." *Vimeo* video, 52:57, 2013. [Online] http://vimeo.com/64644113 [last accessed 26.07.2022].

Bottomore, Stephen. "'Nine Days' Wonder: Early Cinema and Its Sceptics." In *Cinema: The Beginnings and the Future*, edited by Christopher Williams, 135–149. London: University of Westminster Press, 1996.

Bottomore, Stephen "The Panicking Audience? Early Cinema and the 'Train Effect'." *Historical Journal of Film, Radio and Television* 19, no. 2 (1999): 177–216.

Boyle, Deidre. "From Portapak to Camcorder: A Brief History of Guerrilla Television." *Journal of Film and Video* 44, nos. 1–2 (1992): 67–79.

Boym, S. *The Future of Nostalgia*. New York: Basic Books, 2001.

Bowser, Eileen. *The Transformation of Cinema 1907–1915: History of the American Cinema*. Vol. 2. New York: Scribner, 1990.

Bradlet, John M. (J.M.B.). "The Size of the Picture." *Moving Picture World* 8, no. 10 (11 March, 1911): 527.

Breidbach, Olaf, Peter Heering, Matthias Müller, and Heiko Weber. Experimentelle Wissenschaftsgeschichte. In *Experimentelle Wissenschaftsgeschichte*, edited by Olaf Breidbach, Peter Heering, Matthias Müller, and Heiko Weber, 13–72. Paderborn: Fink, 2010.

Brownlow, Kevin. "Silent Films: What Was the Right Speed?" *Sight and Sound* 49, no. 3 (1980): 164–167.

Bruno, Giuliana. *Atlas of Emotion. Journeys in Art, Architecture and Film*. London: Verso, 2002.

Buschauer, Regine. *Mobile Räume. Medien- und diskursgeschichtliche Studien zur Tele-Kommunikation* (Bielefeld: Transcript Verlag, 2010).

Butsch, Richard, "Audiences. Publics, Crowds, Mass." In *The Handbook of Communication History*, edited by P. Simonson, J. Peck, R. Craig, and J. Jackson, 93–108. London: Routledge, 2013.

Butt, John. *Playing with History: The Historical Approach to Musical Performance* (Cambridge: Cambridge University Press, 2002).

Bynum, Caroline. *Metamorphosis and Identity*. New York: Zone Books, 2011.

Byrne, Sarah, Anne Clarke, Rodney Harrison, and Robin Torrence, eds. *Unpacking the Collection: Networks of Material and Social Agency in the Museum*. New York: One World Archaeology, 2011.

Carroll, Noël. "The Grotesque Today: Preliminary Notes Toward a Taxonomy." In *Modern Art and the Grotesque*, edited by Frances S. Connelly, 291–311. Cambridge: Cambridge University Press, 2003.

Casetti, Francesco, Jane Gaines, and Valentina Re, eds. *Dall'inizio, alla fine. Teorie del cinema in prospettiva / In the Very Beginning, at the Very End. Film Theories in Perspective*. Udine: Forum, 2009.

Casetti, Francesco. "Filmic Experience." *Screen* 50, no. 1 (2009): 56–66.

Casetti, Francesco. "Back to the Motherland: The Film Theatre in the Postmedia Age." *Screen* 52, no. 1 (2011): 1–12.

Casetti, Francesco, and Sara Sampietro. "With Eyes, With Hands. The Relocation of Cinema into iPhone." In *Moving Data: The iPhone and the Future of Media*, edited by Pelle Snickars and Patrick Vonderau, 19–32. New York: Columbia University Press, 2012.

Cassirer, E. "Form und Technik." In *Symbol, Technik, Sprache. Aufsätze aus den Jahren 1927–1933*, edited by Ernst Wolfgang Orth and John Michael Krois, 39–89. Hamburg, Meiner Verlag, 1995.

Cavell, Stanley. *The World Viewed*. Cambridge, MA: Harvard University Press, 1971.

Cavell, Stanley. "Conversations with History." Institute of International Studies, UC Berkeley, 7 February 2002. [Online] http://globetrotter.berkeley.edu/people2/Cavell/cavell-con0.html [last accessed 26.07.2022].

Ceram, C. W. *Archaeology of Cinema*. Translated by Richard Winston. London: Thames and Hudson, 1965.

Chateau, Dominique. "The Philosophy of Technology in the Frame of Film Theory: Walter Benjamin's Contribution." In *Technē/Technology: Researching Cinema and Media Technologies – Their Development, Use, and Impact*, edited by Annie van den Oever, 29–50. Amsterdam: Amsterdam University Press, 2014.

Chateau, Dominique, and José Moure. *Screens: From Materiality to Spectatorship – A Historical and Theoretical Reassessment*. Amsterdam: Amsterdam University Press, 2016.

Cherchi Usai, Paolo, David Francis, Alexander Horwath, and Michael Loebenstein, eds. *Film Curatorship: Archives, Museums, and the Digital Marketplace*. Vienna: Austrian Film Museum, 2008.

Christie, Ian. "Will the 3D Revolution Happen? A Brief Perspective on the Long History of Stereoscopy (with special thanks to Eisenstein and Bazin)." In *Technē/Technology: Researching Cinema and Media Technologies – Their Development, Use, and Impact*, edited by Annie van den Oever, 115–135. Amsterdam: Amsterdam University Press, 2014.

Clarke, Arthur C. "Hazards of Prophecy: The Failure of Imagination." In *Profiles of the Future: An Enquiry into the Limits of the Possible*. London: Gollancz, 1962 (rev. 1973).

Collingwood, Robin G. *The Idea of History*. Oxford: Oxford University Press, 1946.

Corrigan, Kevin. "Collaborative Thinking: The Challenge of the Modern University." *Arts & Humanities in Higher Education* 11, no. 3 (2012): 262–72.

Csikszentmihalyi, Mihaly. "Why We Need Things." In *History from Things: Essays on Material Culture*, edited by Steven Lubar and W. David Kingery, 20–29. Washington, London: Smithsonian Institution Press, 1993.

Cuban, Larry. *Teachers and Machines: The Classroom Use of Technology since 1920*. New York: Teachers College Press, 1986.

Cuban, Larry. *Teachers Taught: Constancy and Change in American* Classrooms, *1880–1990*. 2nd. ed. New York: Teachers College Press, 1993.

Cubitt, Sean. "Anedoctal Evidence." *NECSUS. European Journal of Media Studies* (Spring 2013). [Online] http://www.necsus-ejms.org/anecdotal-evidence/ [last accessed 26.07.2022].

Dahlquist, Marina, Doron Galili, Jan Olsson, and Valentine Robert, eds., *Corporeality in Early Cinema: Viscera, Skin, and Physical Form*. Series Early Cinema in Review: Proceedings of Domitor. Bloomington: Indiana University Press, 2018. [Online] https://www.jstor.org/stable/j.ctv6zd9s1 [last accessed 26.07.2022].

Daston, Lorraine, and Katherine Park. *Wonders and the Order of Nature*. New York: Zone Books, 2001.

Derrida, Jacques, and Eric Prenowitz. "Archive Fever: A Freudian Impression." *Diacritics* 25, no. 2 (Summer 1995): 9–63. [Online] http://www.jstor.org/stable/465144 [last accessed 26.07.2022]. http://newsgrist.typepad.com/files/derrida-archive_fever_a_freudian_impression.pdf [###LINK DOES NOT WORK]

Doane, Mary Ann. "The Close-Up: Scale and Detail in the Cinema." *Differences: A Journal of Feminist Cultural Studies* 14 (2003): 89–111.

Donald, James, Anne Friedberg, and Laura Marcus, eds. *Close Up 1927–1933: Cinema and Modernism*. Princeton, NJ: Princeton University Press, 1998.

Dray, William H., *History as Re-Enactment. R.G. Collingwood's Idea of History*. Oxford: Oxford University Press, 1985.

Dreschke, Anja, Ilham Huynh, Raphaela Knipp, and David Sittler, eds. (2016) *Reenactments: Medienpraktiken zwischen Wiederholung und kreativer Aneignung*. Bielefeld: Transcript Verlag, 2016.

Edgerton, David. *The Shock of the Old. Technology and Global History since 1900* (London: Profile Books, 2008).

Edgerton, David. "Innovation, Technology, or History: What Is the Historiography of Technology About." *Technology and Culture* 51, no. 3 (July 2010): 680–697.

Eisenstein, Sergei M. *Film Form: Essays in Film Theory*, edited and translated by Jay Leyda. San Diego, CA: Harcourt, 1949.

Elkington, S., and R. A. Stebbins. *The Serious Leisure Perspective*: *An Introduction*. Abingdon: Routledge, 2014.

Ellis, John. "TV and Cinema: What Forms of History Do We Need?" In *Cinema, Television and History: New Approaches*, edited by Laura Mee and Johnny Walker, 12–25. Newcastle-Upon-Tyne: Cambridge Scholars Publishing, 2014.

Ellis, John. "16 mm Film Editing. Using Filmed Simulation as a Hands-on Approach to TV History." *VIEW Journal of European Television History and Culture* 4, no. 7, 2015. [Online] https://vimeo.com/123212931 [last accessed 26.07.2022].

Ellis, Patrick M., and Colin Williamson. "Object lessons, old and new: experimental media archaelogy in the classroom." *Early Popular Visual Culture*, vol. 18, no. 1 (2020): 2–14.

Elsaesser, Thomas. "The New Film History." *Sight and Sound* 55, no. 4 (Fall 1986): 246–251.

Elsaesser, Thomas. "The New Film History as Media Archaeology." *Cinémas: Revue d'Études Cinématographiques* 14, nos. 2–3 (2004): 75–117.

Elsaesser, Thomas. *Film History as Media Archaeology*. Film Culture in Transition, no. 50. Amsterdam: Amsterdam University Press, 2020.

Enticknap, Leo. *Moving Image Technology: From Zoetrope to Digital*. London: Wallflower, 2005.

Enticknap, Leo. *Film Restoration. The Culture and Science of Audiovisual Heritage*. New York: Palgrave and Macmillian, 2013.

Epstein, Jean. "Magnification" [1921]. Translated by Stuart Liebeman. *October* 3 (Spring 1977): 9–25.

Epstein, Jean. "Magnification." In *French Film Theory and Criticism: A History/Anthology 1907–1939*, edited by Richard Abel, 235–240. Princeton, NJ: Princeton University Press, 1988.

Farge, Arlette. *Le goût de l'archive*. Paris: Éditions Points, 1997.

Ferguson, Jeffrey, ed. *Designing Experimental Research in Archaeology: Examining Technology through Production and Use*. Boulder: University of Colorado Press, 2010.

Fickers, Andreas, "Design als 'mediating interface'. Zur Zeugen- und Zeichenhaftigkeit des Radioapparats." *Berichte zur Wissenschaftsgeschichte* 30, no. 3 (2007), 199–213.

Fickers, Andreas. "Visibly Audible: The Radio Dial as Mediating Interface." In *The Oxford Handbook of Sound Studies*, edited by Trevor Pinch and Karin Bijsterveld, 411–439. Oxford: Oxford University Press, 2012.

Fickers, Andreas, and Annie van den Oever. "Experimental Media Archaeology: A Plea for New Directions." In *Technē / Technology*, edited by Annie van den Oever, 272–278. Amsterdam: Amsterdam University Press, 2014.

Fickers, Andreas. "'Neither Good, Nor Bad; Nor Neutral': The Historical Dispositif of Communication Technologies." In *Journalism and Technological Change: Historical Perspectives, Contemporary Trends*, edited by Martin Schreiber and Clemens Zimmermann, 30–52. Frankfurt am Main: Campus Verlag, 2014.

Fickers, Andreas. "Hands-on. Plädoyer für eine experimentelle Medienarchäologie." *Technikgeschichte* 82, no. 1 (2015): 67–85.

Fickers, Andreas. "Konservative Medienrevolutionen. Überlegungen zu einer Genealogie des Medienwandels." In *Theorien des Medienwandels*, edited by Susanne Kinnebrock, Christian Schwarzenegger, and Thomas Birkner, 259–279. Köln: Herbert von Halem, 2015.

Fickers, Andreas, and A-K. Weber. "Towards an archaeology of television." Editorial. *VIEW: Journal of European Television History and Culture* 4, no. 7 (2015). DOI: 10.18146/2213-0969.2015.jethc076.

Fickers, Andreas. "How to grasp historical media dispositifs in practice." In *Materializing Memories. Dispositifs, Generations, Amateurs*, edited by S. Aasman, A. Fickers and J. Wachelder, 85–91. New York: Bloomsbury, 2018.

Fickers, Andreas, and Annie van den Oever. "(De)Habituation Histories: How to Re-Sensitize Media Historians." In *Hands-On Media History: A New Methodology in the Humanities and Social Sciences*, edited by John Ellis and Nick Hall, 58–75. London: Routledge, 2019.

Fickers, Andreas, and Annie van den Oever. "Doing Experimental Media Archaeology: Epistemological and Methodological Reflections on Experiments with Historical Objects of Media Technologies." In *New Media Archaeologies*, edited by B. Roberts and M. Goodall, 45–68. Amsterdam: Amsterdam University Press, 2019.

Fickers, Andreas, and Stefan Krebs. "'Thinkering' als historischer Erkenntnismodus. Überlegungen zu einer Experimentalisierung der Medienobjektgeschichte." In *Musikobjektgeschichten: Populäre Musik und materielle Kultur*, edited by C. Dörfling, C. Jost and M. Pfleiderer, 73–93. Münster: Waxmann, 2021.

Fisher, Philip. *Wonder, the Rainbow, and the Aesthetics of Rare Experiences*. Cambridge, MA: Harvard University Press, 1998.

Flichy, Patrice. *The Internet Imaginaire*. Cambridge, MA: MIT Press, 2007.

Flueckiger, Barbara. "Aesthetics of Stereoscopic Cinema." *Projections* 6, no. 1 (2012): 101–122.

Flueckiger, Barbara. "Material Properties of Historical Film in the Digital Age." *NECSUS. European Journal of Media Studies* (Fall 2012). [Online] http://www.necsus-ejms.org/material-properties-of-historical-film-in-the-digital-age [last accessed 26.07.2022].

Fossati, Giovanna "Multiple Originals: The (Digital) Restoration and Exhibition of Early Films." In *A Companion to Early Cinema*, edited by André Gaudreault, Nicolas Dulac, and Santiago Hidalgo, 550–567. Malden, MA: Wiley-Blackwell, 2012.

Fossati, Giovanna, and Annie van den Oever. *Exposing the Film Apparatus. The Film Archive as a Research Lab*. Amsterdam: Amsterdam University Press, 2016.

Fossati, Giovanna. *From Grain to Pixel: The Archival Life of Film in Transition* [2009]. 3rd revised ed. Amsterdam: Amsterdam University Press, 2018.

Frassen, Maarten, Gert-Jan Lokhorst, and Ibo van de Poel. "Philosophy of Technology." *Stanford Encyclopedia of Philosophy* [2009], edited by Edward N. Zalta. 2018. [Online] http://plato.stanford.edu/entries/technology/ [last accessed 26. 07.2022].

Fuller, Matthew. *Media Ecologies: Materialist Energies in Technoculture* [2005]. Cambridge, MA: MIT Press, 2007.

Gapps, Stephen. "Mobile Monuments: A view of historical re-enactment and authenticity from inside the costume cupboard of history." *Rethinking History* 13, no. 3 (2009): 395–409.

Garroni, Emilio. *Ricognizione della semiotica. Tre lezioni*. Roma: Officina, 1977.

Gaudreault, André, and Tom Gunning. "Early Cinema as a Challenge to Film History." In *The Cinema of Attractions Reloaded*, edited by Wanda Strauven, 365–380. Amsterdam: Amsterdam University Press, 2006.

Gaudreault, André. "From 'Primitive Cinema' to 'Kine-Attractography.'" In *The Cinema of Attractions Reloaded*, edited by Wanda Strauven, 85–104. Amsterdam: Amsterdam University Press, 2006.

Gaudreault, André. *Film and Attraction: From Kinematography to Cinema* [2008]. Translated by Timothy Barnard. Urbana, IL: University of Illinois Press, 2011.

Gaudreault, André, and Philippe Marion. *The Kinematic Turn. Film in the Digital Era and Its Ten Problems*. Montreal: Caboose, 2012.

Gaudreault, André. "The Future History of a Vanishing Medium." In *Technē/Technology: Researching Cinema and Media Technologies – Their Development, Use, and Impact*, edited by Annie van den Oever, 261–271. Amsterdam: Amsterdam University Press, 2014.

Gaudreault, André. *The End of Cinema? A Medium in Crisis in the Digital Age*. Translated by Timothy Barnard. New York: Columbia University Press, 2015.

Gaudreault, André. "Foreword." In *Technology and Film Scholarship Experience, Study, Theory*, edited by Santiago Hidalgo, 9–12. Series Technology and Film Scholarship. (Amsterdam: Amsterdam University Press, 2018).

Gerber, Doris. *Analytische Metaphysik der Geschichte. Handlungen, Geschichten und ihre Erklärung*. Frankfurt am Main: Suhrkamp Verlag, 2012.

Ginzburg, Carlo. *Spurensicherung. Die Wissenschaft auf der Suche nach sich selbst*. Berlin: Wagenbach, 2011.

Gitelman, Lisa. *Always Already New: Media, History, and the Data of Culture*. Cambridge, MA: MIT Press, 2008.

Gleitsmann, Rolf-Jürgen, Rolf-Ulrich Kunze, and Günther Oetzel. "Zwischen Inszenierung und Zeitgeist – Technikmuseen." In *Technikgeschichte*, edited by Rolf-Jürgen Gleitsmann, Rolf-Ulrich Kunze, and Günther Oetzel, 92–110. Konstanz: UVK Verlagsgesellschaft, 2009.

Goethe, Johann Wolfgang. "Der Versuch als Vermittler von Objekt und Subjekt." In *Gedenkausgabe der Werke, Briefe und Gespräche*, vol. 16, 844–855. Zürich: Ernst Beutler, 1949. First published in 1792.

Gooding, D. "History in the Laboratory: Can We Tell What Really Went On?" In *The Development of the Laboratory. Essays on the Place of Experiment in Industrial Civilization*, edited by F. James, 63–82. Basingstoke, London: Macmillan, 1989.

Gorki [Gorky], Maxim. "In het rijk der schaduwen" [1896]. In *De Beginjaren Van De Film En De Tijd Van De Avant-Garde 1896–1931*, edited by Annie van den Oever, Frank Kessler, Patricia Pisters, and Steven Willemsen, 17–28. Nijmegen: In De Walvis, 2015.

Gorki [Gorky], Maxim. "Lumière in Rusland." In *De Beginjaren Van De Film En De Tijd Van De Avant-Garde 1896–1931*, edited by Annie van den Oever, Frank Kessler, Patricia Pisters, and Steven Willemsen, 17–28. Nijmegen: In De Walvis, 2015.

Gorky, Maxim. "Last Night I was in the Kingdom of Shadows." In *The Kingdom of Shadows*, edited by Colin Harding and Simon Popple, 5–11. London: Cygnus Arts, 1996.

Gracy, Karen F. *Film Preservation: Competing Definitions of Value, Use, and Practice*. Chicago, IL: The Society of American Archivists, 2007.

Greimer, Peter. *Die Farben der Vergangenheit. Wie Geschichte zu Bildern wird*. Munich: Beck, 2022.

Grosswiler, Paul. *Old New Media. From Oral to Virtual Environments*. New York: Peter Lang, 2013.

Gunning, Tom, "The Cinema of Attraction: Early Film, Its Spectator and the Avant-Garde." In *Early Cinema: Space Frame Narrative*, edited by Thomas Elsaesser and Adam Barker, 56–62. London: British Film Institute, 1990.

Gunning, Tom. *D.W. Griffith and the Origins of American Narrative Film*. Chicago, IL: University of Illinois Press, 1994.

Gunning, Tom. "An Aesthetic of Astonishment: Early Film and the Incredulous Spectator." In *Viewing Positions: Ways of Seeing Film*, edited by Linda Williams, 114–133. New Brunswick, NJ: Rutgers University Press, 1995.

Gunning, Tom. "'Animated Pictures', Tales of Cinema's Forgotten Future." *Michigan Quarterly Review* 34, no. 4 (1995): 465–485. [Online] http://hdl.handle.net/2027/spo.act2080. 0034.004:02 [last accessed 26.07.2022].

Gunning, T. "Re-Newing Old Technologies: Astonishment, Second Nature, and the Uncanny in Technology from the Previous Turn-of-the-Century." In *Rethinking Media Change: The Aesthetics of Transition*, edited by D. Thorburn and H. Jenkins, 39–59. Cambridge, MA: MIT Press, 2003.

Gunning, Tom. "Hand and Eye: Excavating a New Technology of the Image in the Victorian Era." Special Issue: Papers and Responses from the Ninth Annual Conference of the North American Victorian Studies Association. *Victorian Studies* 54, no. 3 (2012): 495–516. [Online] https://www.jstor.org/stable/10.2979/victorianstudies.54.3.495 [last accessed 26.07.2022].

Hahn, Hans Peter. "Von der Ethnografie des Wohnzimmers." In *Die Sprache der Dinge*: *Kulturwissenschaftliche Perspektiven auf die materielle Kultur*, edited by Elisabeth Tietmeyer, Claudia Hirschberger, Karoline Noack, and Jane Redlin, 9–21, Münster: Waxmann, 2010.

Hård, Mikael, and Andrew Jamison, eds. *The Intellectual Appropriation of Technology. Discourses on Modernity, 1900–1939* (Cambridge, MA: MIT Press, 1998).

Harkema, Gert Jan. *Aesthetic Experiences of Presence. Case Studies in Film Exhibition, 1896–1898*. Stockholm: Stockholm University, 2019.

Heering, Peter, and Roland Witje, eds. *Learning by Doing. Experiments and Instruments in the History of Science Teaching*. Stuttgart: Franz Steiner Verlag, 2011.

Heering, Peter, Michael Markert, and Heiko Weber, eds. *Experimentelle Wissenschafts-geschichte didaktisch nutzbar machen. Ideen, Überlegungen und Fallstudien*. Flensburg: Flensburg University Press, 2012.

Heidegger, Martin. "Die Frage der Technik. " In Martin Heidegger, *Vorträge und Aufsätze*, 5–36. Frankfurt am Main: Vittorio Klostermann, 2000.

Hertz, G., and P. Jussi. "Zombie Media: Circuit Bending Media Archaeology into an Art." *Leonardo* 45, no. 5 (2012): 424–430.

Heßler, Martina. *Kulturgeschichte der Technik*. Frankfurt: Campus Verlag, 2012.

Hidalgo, Santiago. "Introduction. The Discursive Spaces Between a History of Film." In *Technology and Film Scholarship Experience, Study, Theory*, edited by Santiago Hidalgo, 13–31. Amsterdam: Amsterdam University Press, 2018.

Hockney, David. *Secret Knowledge. Rediscovering the Lost Techniques of the Old Masters*. London: Thames & Hudson, 2006.

Hörisch, Jochen. *Der Sinn und die Sinne. Eine Geschichte der Medien*. Frankfurt am Main: Eichborn Verlag, 2001.

Howes, David. "The Expanding Field of Sensory Studies." Version 1.0 (August, 2013). [Online] https://sensorystudies.org [last accessed 26.07.2022].

Huhtamo, Erkki. "From Kaleidoscomaniac to Cybernerd: Toward an Archeology of the Media." In Electronic Culture: Technology and Visual Representation, edited by Timothy Druckrey, 296–303. New York: Aperture, 1996.

Huhtamo, Erkki, "From Kaleidoscomaniac to Cybernerd. Towards an Archaeology of the Media." *Leonardo* 30, no. 3 (1997): 221–224.

Huhtamo, Erkki, "Elements of Screenology: Toward an Archaeology of the Screen." *ICONICS: International Studies of the Modern Image* 7 (2004): 31–82.

Huhtamo, Erkki. "Thinkering with Media: On the Art of Paul DeMarinis." In *Buried in Noise*, edited by Paul DeMarinis, 33–39. Heidelberg: Kehrer, 2011.

Huhtamo, Erkki, and Jussi Parikka, eds. *Media Archaeology. Approaches, Applications, and Implications*. Berkeley, CA: University of California Press, 2011.

Huhtamo, Erkki. "Towards a History of Peep Practice." In *A Companion to Early Cinema*, edited by André Gaudreault, Nicolas Dulac, and Santiago Hidalgo, 32–51. Chichester: Wiley, 2012.

Huhtamo, Erkki. *Illusions in Motion. Media Archaeology of the Moving Panorama and Related Spectacles*. Cambridge, MA: MIT Press, 2013.

Huhtamo, Erkki. "Art in the Rear-View Mirror. The Media-Archaeological Tradition in Art." In *Companion to Digital Art*, edited by Christiane Paul, 69–110, Oxford, West Sussex: John Wiley & Sons, 2016.

Huhtamo, Erkki, and Doron Galili. "The Pasts and Prospects of Media Archaeology." *Early Popular Visual Culture* 18, no. 4 (2020): 333–339. [Online] https://www.tandfonline.com/doi/full/10.1080/17460654.2021.2016195 [last accessed 26.07.2022].

Huyssen, A. "Nostalgia for ruins." *Grey room* 23 (2006): 6–21.

Ihde, D. *Experimental Phenomenology: An Introduction*. New York: State University of New York Press, 1986.

Ilgner, Christian, and Dietmar Linke. "Filmtechnick – Vom Maltesekreuz zum Panzerkino." In *100 Jahre Kino, Oskar Messter – Filmpionier der Kaiserzeit. Katalog zur Ausstellung*, edited by Martin Loiperdinger. Frankfurt am Main: Stroemfeld, Roter Stern, 1994.

Jackson, S. J. "Rethinking Repair." In *Media Technologies: Essays on Communication, Materiality and Society*, edited by T. Gillespie, P. Boczkowski, and K. Foot, 221–239. Cambridge MA: MIT Press, 2014.

Jenkins, Henry. *Convergence Culture: Where Old and New Media Collide*. New York: New York University Press, 2006.

Keidl, Philipp Dominik, "Toward a Public Media Archaeology: Museums, Media, and Historiography." *The Moving Image* 17, no. 2 (Fall 2017): 20–39.

Kessler, Frank. "Het geheugen van de cinema." In *Lang leve de film!* edited by Dick Smits, 25–30. Nijmegen: Vrienden van het Filmarchief, 1995.

Kessler, Frank. "The Cinema of Attractions as *Dispositif*." In *The Cinema of Attractions Reloaded*, edited by Wanda Strauven, 57–69. Amsterdam: Amsterdam University Press, 2006.

Kessler, Frank. "Notes on *Dispositif*." In *Frank Kessler*, 2007. [Online] http://www.frankkess
ler.nl/wp-content/uploads/2010/05/Dispositif-Notes.pdf [last accessed 26.07.2022].

Kessler, Frank. "What You Get Is What You See: Digital Images and the Claim on the Real."
In *Digital Material. Tracing New Media in Everyday Life and Technology*, edited by
Marianne van den Boomen, Sybille Lammes, Ann-Sophie Lehmann, Joost Raessens, and
Mirko Tobias Schäfer, 187–197. Amsterdam: Amsterdam University Press, 2009.

Kessler, Frank. "Viewing Pleasures, Pleasuring Views. Forms of Spectatorship in Early
Cinema." In *Film – Cinema – Spectator: Film Reception*, edited by Irmbert Schenk, Margrit
Tröhler, and Yvonne Zimmermann. Marburg: Schüren, 2010.

Kinnebrock, Susanne, Christian Schwarzenegger, and Thomas Birkner, eds., *Theorien des
Medienwandels*. Köln: Herbert von Halem, 2015.

Kittler, Friedrich. *Gramophone, Film, Typewriter*. Translated, with an Introduction, by Geoffrey
Winthrop-Young and Michael Wutz. Stanford, CA: Stanford University Press, 1999.

König, Wolfgang. *Technikgeschichte. Eine Einführung in ihre Konzepte und
Forschungsergebnisse*. Stuttgart: Steiner Verlag, 2009.

Kracauer, Siegfried. *Geschichte – Von den letzten Dingen*. Frankfurt am Main: Suhrkamp, 1971.

Krebs, S., G. Schabacher, and H. Weber. "Kulturen des Reparierens und die Lebensdauer der
Dinge." In *Kulturen des Reparierens*, edited by S. Krebs, G. Schabacher, and H. Weber,
9–46. Bielefeld: Transcript Verlag, 2018.

Kümmel-Schnur, Albert, and Christian Kassung, eds., *Bildtelegraphie. Eine Mediengeschichte
in Patenten (1840–1930)*. Bielefeld: Transcript Verlag, 2012.

Landwehr, Achim. *Die anwesende Abwesenheit der Vergangenheit: Essay zur
Geschichtstheorie*. Frankfurt am Main: S. Fischer, 2016.

Latour, Bruno, and Steve Woolgar. *Laboratory Life: The Construction of Scientific Facts*.
Princeton NJ: Princeton University Press, 1979.

Latour, Bruno. *Science in Action: How to Follow Scientists and Engineers Through Society*.
Milton Keynes: Open University Press, 1987.

Latour, Bruno. *We Have Never Been Modern*. Translated by Catherine Porter. Cambridge,
MA: Harvard University Press, 1993.

Latour, Bruno. *Reassembling the Social: An Introduction to Actor-Network Theory*. Oxford:
Oxford University Press, 2005.

Latour, Bruno, and Adam Lowe. "The Migration of the Aura or How to Explore the Original
through its Facsimiles." In *Switching Codes: Thinking through Digital Technology in the
Humanities and the Arts*, edited by Thomas Bartscherer and Roderick Coover, 1–18.
Chicago: University of Chicago Press, 2010. [Online] http://www.bruno-latour.fr/sites/de
fault/files/108-ADAM-FACSIMILES-GB.pdf [last accessed 26.07.2022].

Lave, Jean, and Etienne Wenger. *Situated Learning: Legitimate Peripheral Participation*.
Cambridge: Cambridge University Press, 1991.

Lawson, Colin, and Robin Stowell. *The Historical Performance of Music: An Introduction*.
Cambridge: Cambridge University Press, 1999.

Lehmann, Ann-Sophie."Objektstunden. Vom Materialwissen zur Materialbildung."
In *Materialität*, edited by Herbert Kalthoff, Torsten Cress, and Tobias Röhl, 171–193.
Leiden: Brill | Fink, 2016.

Loiperdinger, Martin, and Ludwig Volg-Bienek. "Screening the Poor 1888–1914." DVD Edition
Filmmuseum 64, 2011.

Lowenthal, David. *The Past is a Foreign Country*. Cambridge: Cambridge University Press,
1986.

Ludwig, David, and Cornelia Weber. "A Rediscovery of Scientific Collections As Material Heritage? The Case of University Collections in Germany." *Studies in History and Philosophy of Science*, Part A 44, no. 4 (2013): 652–659.

Lundemo, Trond. "The Impact of Technological Innovations on the Historiography and Theory of Cinema, La Cinémathèque québécoise, Montreal (1–6 November 2011): Lost in Translation? On the Diverging Responses to the Question Concerning Technology." *NECSUS. European Journal of Media Studies* (2011). [Online] http://www.necsus-ejms.org/the-impact-of-technological-innovations-on-the-historiography-and-theory-of-cinema-la-cinematheque-quebecoise-montreal-1-6-november-2011 [last accessed 26.07.2022].

MacDonald, H. *Vesper Flights. New and Collected Essays*. London: Jonathan Cape, 2020.

Mannoni, Laurent. *Le Mouvement continué: Catalogue illustré de la collection des appareils de la Cinémathèque française*. Paris: Cinémathèque française-Mazzotta, 1996.

Manovich, Lev. *The Language of New Media*. Cambridge, MA: MIT Press, 2001.

Margithazi, Béja. "'Last night I was in the Kingdom of Shadows . . . ' The Role of Body and Senses in Various 'First Contact' Narratives." *Apertúra* (2012). [Online] https://www.apertura.hu/2012/osz/margithazi-the-role-of-body-and-senses/ [last accessed 26.07.2022].

Marks, Laura U. *The Skin of the Film: Intercultural Cinema, Embodiment, and the Senses*. Durham, NC: Duke University Press, 2000.

Martin, Adrian. "Turn the Page: From Mise en scène to Dispositif." *Screening the Past* 31 (2011): 1–15. [Online] http://www.screeningthepast.com/2011/07/turn-the-page-from-mise-en-scene-to-dispositif/ [last accessed 26.07.2022].

Marvin, Carolyn. *When Old Technologies Were New: Thinking About Electric Communication in the Late Nineteenth Century*. Oxford: Oxford University Press, 1990.

Marx, Leo. "Technology: The Emergence of a Hazardous Concept." *Technology and Culture* 51, no. 3 (July 2010): 561–577.

Masson, Eef. "Of Pits and Vaults: The Historiographic Value of Educational Collections in Great Britain." *The Moving Image* 2, no. 1 (2002): 47–72.

Maurice Merleau-Ponty. *Phenomenology of Perception*. Translated by Colin Smith. New York: Routledge, 2007.

Maza, Sarah. *Thinking about History*. Chicago: University of Chicago Press, 2018.

McLuhan, Marshall. *The Gutenberg Galaxy: The Making of Typographic Man*. Toronto: University of Toronto Press, 1962.

McLuhan, Marshall. *Understanding Media: The Extensions of Man* [1964]. Cambridge, MA: MIT Press, 1994.

Méadel, Cécile. *Quantifier le public. Histoire des mesures d'audience à la radio et la télévision*. Paris: Economica, 2010.

Mitman, Gregg, and Kelley Wilder. "Introduction." In *Documenting the World. Film, Photography, and the Scientific Record*, edited by Gregg Mitman and Kelley Wilder, 1–22. Chicago: University of Chicago Press, 2016.

Mori, Masahiro. "The Uncanny Valley." *Energy* 7, no. 4 (1970): 33.

Motrescu-Mayes, Annamaria, and Susan Aasman. *Amateur Media and Participatory Cultures: Film, Video, and Digital Media*. London: Routledge, 2019.

Müller, Eggo, "Formatted Spaces of Participation: Interactive Television and the Reshaping of the Relationship between Production and Consumption." In *Digital Material*, edited by Marianne van den Boomen, Sybille Lammes, Ann-Sophie Lehmann, and Mirko Tobias Schäfer, 47–61. Amsterdam: Amsterdam University Press, 2009.

Mulvey, Laura. *Death 24 x a Second*. London: Reaktion Books, 2006.

Münsterberg, Hugo. *The Film: A Psychological Study*. New York: Dover Publications, 1970.

Musser, Charles. *The Emergence of Cinema: The American Screen to 1907*. Berkeley, CA: University of California Press, 1990.

Musser, Charles. *Before the Nickelodeon: Edwin S. Porter and the Edison Manufacturing Company*. Berkeley, CA: University of California Press, 1991.

Musser, Charles, and Carol Nelson. *High-Class Moving Pictures: Lyman H. Howe and the Forgotten Era of Travelling Exhibition, 1880–1920*. Princeton, NJ: Princeton University Press, 1991.

Musser, Charles. "Historiographic Method and the Study of Early Cinema." *Cinema Journal* 1 (2004): 101–107.

Nerone, J. "The Future of Communication History." *Critical Studies in Media Communication* 23, no. 3 (2007): 259.

Noordegraaf, Julia, Vinzenz Hediger, Cosetta Saba, and Barbara Le Maitre, eds. *Preserving and Exhibiting Media Art. Challenges and Perspectives*. Amsterdam: Amsterdam University Press, 2013.

Noordegraaf, Julia. "Digitization." In *Encyclopedia of Aesthetics*, edited by Michael Kelly, 401–404. Oxford: Oxford University Press, 2014.

Nye, David E. *Electrifying America: Social Meanings of a New Technology, 1880–1940*. Cambridge, MA: MIT Press, 1991.

Nye, David E. *Technology Matters. Questions to Live With*. Cambridge, MA: MIT Press, 2007.

Odin, Roger. "Spectator, Film and the Mobile Phone." In *Audiences. Defining and Researching Screen Entertainment Reception*, edited by Ian Christie, 155–169. Amsterdam: Amsterdam University Press, 2012.

Odin, Roger. "Quand le téléphone portable rencontre le cinéma." In *Téléphone mobile et création*, edited by Laurence Allard, Laurent Creton, and Roger Odin, 37–54. Paris: Armand Colin, 2014.

Odin, Roger. "Cinema in My Pocket." In *Exposing the Film Apparatus*, edited by Giovanna Fossati and Annie van den Oever, 45–54. Amsterdam: Amsterdam University Press, 2016.

Oettermann, Stephan. *The Panorama: History of a Mass Medium*. New York: Zone Books, 1997.

Onians, John. "'I wonder . . . ' A short history of amazement." In *Sight and Insight: Essays on Art and Culture in Honor of E. H. Gombrich at 85*, edited by John Onians, 11. London: Phaidon Press, 1994.

Oudshoorn, N., and Trevor Pinch, eds. *How Users Matter: The Co-Construction of Users and Technologies*. Cambridge, MA: MIT Press, 2003.

Parikka, Jussi. "Practising Media Archaeology: Creative Methodologies for Remediation." In *What Is Media Archaeology?* edited by Jussi Parikka, 136–158. Cambridge: Polity Press, 2012.

Park, D., N. Jankowski and S. Jones. *The Long History of New Media: Technology, Historiography, and Contextualizing Newness*. (2011). [Online]

Peters, Benjamin. "And Lead Us Not Into Thinking the New is New: A Bibliographic Case for New Media History". *New Media and Society*, 11, nos. 1–2 (2009): 13–30.

Peters, Sibylle. *Der Vortrag als Performance*. Bielefeld: Transcript Verlag, 2011.

Pethke, Stefan, and Stefanie Schlüter. "Sammeln und Vermitteln. Filmmuseen im Film." *Kunst der Vermittlung* (blog). 2009. [Online] http://www.kunst-der-vermittlung.de/dossiers/film vermittlung-und-filmmuseum/museen-im-film/ [last accessed 26.07.2022].

Pickering, A. *The Mangle of Practice: Time, Agency, and Science*. Chicago: University of Chicago Press, 1995.

Pink, Sarah. *Doing Sensory Ethnography*. London: Sage, 2009.

Polywka, Andrea, and Antoine Prévost-Balga. "Introduction." In *Configurations of Film Series*, edited by Benoît Turquety, 7–16. Lüneburg: Meson Press, 2019.

Praz, Mario. *Histoire de la décoration d'intérieur: La philosophie de l'ameublement*. London: Thames and Hudson, 1994.

Ravetto-Biagioli, Kriss. *Digital Uncanny*. Oxford: Oxford University Press, 2019. [Online] https://oxford.universitypressscholarship.com/view/10.1093/oso/9780190853990.001.0001/oso-9780190853990 [last accessed 26.07.2022].

Rheinberger, Hans Jörg. *Die Farben des Tastens. Hans-Jörg Rheinberger im Gespräch mit Alexandru Bulucz*. Frankfurt am Main: Edition Faust, 2015.

Rheinberger, Hans-Jörg. "Mit den Händen denken. Im Gespräch mit Heiko Roehl." In *Experimentalität. Hans-Jörg Rheinberger im Gespräch über Labor, Atelier und Archiv*, 228–236. Berlin: Kadmos, 2018.

Rheinberger, Hans-Jörg. *Spalt und Fuge. Eine Phänomenologie des Experiments*. Frankfurt am Main: Suhrkamp, 2021.

Rieß, Falk. (1998). Erkenntnis durch Wiederholung – Eine Methode zur Geschichtsschreibung des Experiments. In *The Development of the Laboratory. Essays on the Place of Experiment in Industrial Civilization*, edited by Frank James, 157–172. Basingstoke, London: Macmillan, 1998.

Riggins, Stephen, "Fieldwork in the Living Room. An Autoethnographic Essay." In *The Socialness of Things: Essays on the Socio-Semiotics of Objects*, edited by Stephen Riggins, 101–147. Berlin: De Gruyter, 1994.

Roepke, Martina. *Privat-Vorstellung: Heimkino in Deutschland vor 1945*. Hildesheim: Olms, 2006.

Roepke, Martina. "Tracing the 17.5mm Practices in Germany (1902–1908)." *Film History* 19 (2007): 344–352.

Rogers, Ariel. *Cinematic Appeals: The Experience of New Movie Technologies*. New York: Columbia University Press, 2013. DOI:10.7312/roge15916.

Röther, Monika. *The Sound of Distinction. Phonogeräte in der Bundesrepublik Deutschland. Eine Objektgeschichte (1957–1973)*. Marburg: Tectum Verlag, 2012.

Rowland, Richard. "The Speed of Projection of Film." *Transactions of the SMPE* 10, no. 27 (1926): 77–79.

Salehabadi, D. "The Scramble for Digital Waste in Berlin." In *Cycling and Recycling. Histories of Sustainable Practices*, edited by Ruth Oldenziel and Helmuth Trischler, 202–214. Berghahn: New York, 2016.

Salt, Barry. *Film Style and Technology: History and Analysis* [1983]. London: Starword, 2009.

Saraydar, Stephen C. *Replicating the Past: The Art and Science of the Archaeological Experiment*. Long Grove: Waveland Press, 2008.

Saxer, Marion, ed., *Spiel (mit) der Maschine. Musikalische Medienpraxis in der Frühzeit von Phonographie, Selbstspielklavier, Film und Radio*. Bielefeld: Transcript, 2016.

Schiffer, Michael B., and James M. Skibo, "Theory and Experiment in the Study of Technological Change." *Current Anthropology* 28 (1987): 595–622.

Schiffer, Michael B. *The Archaeology of Science. Studying the Creation of Useful Knowledge*. Heidelberg: Springer, 2013.

Scheinfeigel, Maxime. "La fable documentaire." In *Jean Rouch*, 101–116. Paris: CNRS Éditions, 2008.

Schneider, Alexandra. "Das Kamerastativ." In *Das Wörterbuch kinematografischer Objekte*, edited by Marius Böttcher, Dennis Göttel, Friederike Horstmann, Jan Philipp Müller, Volker Pantenburg, Linda Waack, and Regina Wuzella, 73–74. Berlin: August Verlag, 2014.

Schneider, Alexandra. "Carole und Brenda. Das Paradox des Stativs oder eine Archäologie des Amateurfilms." In *Archäologie des Amateurfilms*, edited by Karin Fest and Vrääth Öhner, 58–70. Vienna: Filmmuseum, 2015.

Sconce, Jeffrey. *Haunted Media. Electronic Presence from Telegraphy to Television*. Durham: Duke University Press, 2000.

Serres, Michel. *The Five Senses. A Philosophy of Mingled Bodies*. London: Continuum, 2008.

Serres, Michel. *Petite poucette*. Paris: Le Pommier, 2012.

Sewell, Philip W. *Television in the Age of Radio: Modernity, Imagination, and the Making of a Medium*. New Brunswick, NJ: Rutgers University Press, 2014.

Shirky, Clay. *Cognitive Surplus. How Technology Makes Consumers into Collaborators*. New York, London: Penguin Books, 2010.

Shklovsky, Viktor. "Art as Technique." In *Russian Formalist Criticism: Four Essays*, edited by Lee T. Lemon and Marion J. Reis, 3–24. Lincoln: University of Nebraska Press, 1965.

Sibum, O. "Die Sprache der Instrumente. Eine Studie zur Praxis und Repräsentation des Experimentierens." In *Experimental Essays – Versuche zum Experiment*, edited by M. Heidelberger and F. Steinle, 141–156. Baden-Baden: Nomos, 1998.

Siegel, Harmon. "Feats of Prestidigitation." In *William Kentridge: Smoke, Ashes*, *Fable*, edited by Margaret K. Koerner, 142–172. New Haven, London: Yale University Press, 2018.

Silverstone, Roger, and Eric Hirsch, eds. *Consuming Technologies: Media and Information in Domestic Spaces*. London: Routledge, 1994.

Silverstone, Roger, and Leslie Haddon. "Design and the Domestication of ICTs: Technical Change and Everyday Life." In *Communication by Design. The Politics of Information and Communication Technologies*, edited by Roger Silverstone and Robin Mansell, 44–74. Oxford: Oxford University Press, 1996.

Simondon, Gilbert, *Du monde d'existence des objets techniques*. Paris: Éditions Aubier, 1958.

Sinnerbrink, Robert. "Technē and Poiēsis: On Heidegger and Film Theory." In *Technē / Technology: Researching Cinema and Media Technologies – Their Development, Use, and Impact*, edited by Annie van den Oever, 65–80. Amsterdam: Amsterdam University Press, 2014.

Slootweg, Tom. *Resistance, Disruption and Belonging: Electronic Video in Three Amateur Modes*. Groningen: University of Groningen, 2018.

Smith, Adam. "History of Astronomy." In *Essays on Philosophical Subjects*, edited by I. S. Ross, 6–33. Indianapolis: Liberty Classics, 1982.

Smith, Mark M. "Producing sense, consuming sense, making sense: perils and prospects for sensory history." *Journal of Social Sciences* 40, no. 4 (2007): 841–858.

Smith, Mark M. *Sensing the Past. Seeing, Hearing, Smelling, Tasting, and Touching in History*. Berkeley: University of California Press, 2007.

Sorlin, Pierre. "Television and the Close-Up." In *Cinema Futures: Cain, Abel or Cable? The Screen Arts in the Digital Age*, edited by Thomas Elsaesser and Kay Hoffmann, 119–126. Amsterdam: Amsterdam University Press, 1998.

Spadoni, Robert. *Uncanny Bodies: The Coming of Sound Film and the Origins of the Horror Genre*. Oakland, CA: University of California Press, 2007. [Online] https://www.jstor.org/stable/10.1525/j.ctt1ppxsb [last accessed 26.07.2022].

Stafford, Barbara Maria. *Artful Science: Enlightenment, Entertainment and the Eclipse of Visual Education*. Cambridge, MA: MIT Press, 1994.

Sterne, Jonathan. *MP3. The Meaning of a Format*. London: Duke University Press, 2012.

Stewart, Susan. *On Longing: Narratives of the Miniature, the Gigantic, the Souvenir, the Collection*. Durham, NC: Duke University Press, 1993.

Stiegler, Bernard. *Technics and Time 1: The Fault of Epimetheus*. Translated by Stephen Barker. Stanford, CA: Stanford University Press, 1994.

Stiegler, Bernard. *Technics and Time 2: Disorientation*. Translated by Stephen Barker. Stanford, CA: Stanford University Press, 2008.

Stiegler, Bernard. "The Organology of Dreams and Arche-Cinema." Translated by Daniel Ross. *Screening the Past* 36 (June 2013). [Online] http://www.screeningthepast.com/issue-36-special-feature/the-organology-of-dreams-and-arche-cinema/ [last accessed 26.07.2022].

Strauven, Wanda. "From 'Primitive Cinema' to 'Marvelous'." In *The Cinema of Attractions Reloaded*, edited by Wanda Strauven, 105–120. Amsterdam: Amsterdam University Press, 2006.

Strauven, Wanda, ed. *The Cinema of Attractions Reloaded*. Amsterdam: Amsterdam University Press, 2007.

Strauven, Wanda. "The Observer's Dilemma: To Touch or Not to Touch." In *Media Archaeology: Approaches, Applications, and Implications*, edited by Erkki Huhtamo and Jussi Parikka, 148–163. Berkeley, CA: University of California Press, 2011.

Strauven, Wanda. "Media Archaeology: Where Film History, Media Art, and New Media (Can) Meet." In *Preserving and Exhibiting Media Art. Challenges and Perspectives*, edited by Julia Noordegraaf, Cosetta Saba, Barbara Le Maitre, and Vinzenz Hediger, 59–80. Amsterdam: Amsterdam University Press, 2013.

Sturken, Marita, Douglas Thomas, and Sandra J. Ball-Rokeach, eds. *Technological Visions. The Hopes and Fears That Shape New Technologies*. Philadelphia: Temple University Press, 2004.

Thompson, Richard F., and William A. Spencer. "Habituation: A Model Phenomenon for the Study of Neuronal Substrates of Behavior." *Psychological Review*, 73 (1996): 16–43.

Tilmans, Karin, Frank van Vree, and Jay Winter, eds. *Performing the Past. Memory, History, and Identity in Modern Europe*. Amsterdam: Amsterdam University Press, 2010.

Tosh, John. *The Pursuit of History. Aims, Methods and New Directions in the Study of the Past*. London: Routledge, 2016.

Tsivian, Yuri. *Early Cinema in Russia and Its Cultural Reception*. Translated by Alan Bodger. Chicago: University Press Chicago, 1994.

Turquety, Benoît. *Inventer le cinéma. Épistémologie: problèmes, machines*. Lausanne: L'Âge d'Homme, 2014.

Turquety, Benoît. "Le naturel et le mécanique: le Kinémacolor à la conquête de Paris, ou Charles Urban *vs*. Charles Pathé." *1895. Revue d'histoire du cinéma* 71 (2014): 81–105.

Turquety, Benoît. "Toward an Archaeology of the Cinema / Technology Relation: From Mechanization to 'Digital Cinema'." In *Technē /Technology. Researching Cinema and Media Technologies, Their Development, Use and Impact*, edited by Annie van den Oever, 50–64. Amsterdam: Amsterdam University Press, 2014.

Turquety, Benoît. "On Viewfinders, Video Assist Systems, and Tape Splicers: Questioning the History of Techniques and Technology in Cinema." In *Technology and Film Scholarship Experience, Study, Theory*, edited by Santiago Hidalgo, 239–260. Series Technology and Film Scholarship. Amsterdam: Amsterdam University Press, 2018.

Turquety, Benoît. *Inventing Cinema: Machines, Gestures, and Media History*. Amsterdam: Amsterdam University Press, 2019.

Turquety, Benoît. "Medium, Format, Configuration: The Displacement of Film." In *Configurations of Film Series*, edited by Benoît Turquety, 17–54. Lüneburg: Meson Press, 2019.

Uricchio, William. "Archives and Absences." *Film History* 7, no. 3 (Fall 1995): 256–263.

Uricchio, William. "There's More to the Camera's Obscura Than Meets the Eye." In *Arrêt sur image et fragmentation du temps / Stop Motion, Fragmentation of Time*, edited by François Albera, Marta Braun and André Gaudreault, 103–120. Lausanne: Cinema Editions Payot, 2002.

Uricchio, William. "Historicizing Media in Transition." In *Rethinking Media Change: The Aesthetics of Transition*, edited by David Thorburn and Henry Jenkins, 23–38. Cambridge, MA: MIT Press, 2003.

Uricchio, William. "Television's First Seventy-Five Years: The Interpretive Flexibility of a Medium in Transition." In *The Oxford Handbook of Film and Media Studies*, edited by Robert P. Kolker, 286–305. Oxford: Oxford University Press, 2008.

Valéry, Paul. "La conquête de l'ubiquité" [1928]. In *Oeuvres*: *Pièces sur l'art*, vol. 2, 1283–1287. Paris: Gallimard, 1960. [Online] http://classiques.uqac.ca/classiques/Valery_paul/conquete_ubiguite/valery_conquete_ubiquite.pdf [last accessed 26.07.2022].

Valéry, Paul. *Aesthetics*. Translated by Ralph Manheim. Introduction by Herbert Read. London: Routledge and Kegan Paul, 1964.

Valéry, Paul. *Selected Writings*. Translated by Malcolm Cowley. New York: New Directions, 1964.

Van den Oever, Annie. "From Technology to Medium." In *Dall'inizio, alla fine. Teorie del cinema in prospettiva / In the Very Beginning, at the Very End. Film Theories in Perspective*, edited by Francesco Casetti, Jane Gaines, and Valentina Re, 131–140. Udine: Forum, 2009.

Van den Oever, Annie. "Monstration and the Monstrous. The Grotesque in the Very Beginning and at the Very End." In *Proceedings of the XVI International Film Studies Conference-Permanent Seminar on History of Film Theories. Film Theories in Perspective*, edited by F. Casetti, J. Gaines and V. Re, 229–242. Udine: Forum, 2010.

Van den Oever, Annie. "*Ostranenie*, 'The Montage of Attractions', and Early Cinema's 'Properly Irreducible *Alien* Quality'." In *Ostrannenie. On "Strangeness"' and the Moving Image: The History, Reception, and Relevance of a Concept*, edited by Annie van den Oever, 33–60. The Key Debates. Mutations and Appropriations in European Film Studies. Amsterdam: Amsterdam University Press, 2010.

Van den Oever, Annie. "The Prominence of Grotesque Figures in Visual Culture Today. Rethinking the Ontological Status of the (Moving) Image from the Perspective of the Grotesque." *Image and Text* 18 (2011): 100–123.

Van den Oever, Annie. "The Aesthetics and Viewing Regimes of Cinema and Television, and their Dialectics." In *Audiences: Defining and Researching Screen Entertainment Reception*, edited by Ian Christie, 113–127. Amsterdam: Amsterdam University Press, 2012.

Van den Oever, Annie. "The Medium-Sensitive Experience and the Paradigmatic Experience of the Grotesque, 'Unnatural,' or 'Monstrous.'" *Leonardo*, 46, no. 1 (2013): 88–89.

Van den Oever, Annie, ed. "Introduction". In *Technē /Technology. Researching Cinema and Media Technologies, Their Development, Use and Impact.*, edited by Annie van den Oever, 15–26. The Key Debates: Mutations and Appropriations in European Film Studies, 4 Amsterdam: Amsterdam University Press, 2014

Van den Oever, Annie, and E. Tan. *Settling the unsettling: medium sensitization and desensitization cycles and the adaptation to and acceptance of novel media by viewers*. Project Proposal RUG/UvA, 2014.

Van den Oever, Annie, ed. *Technē/Technology: Researching Cinema and Media Technologies – Their Development, Use, and Impact. The Key Debates*. The Key Debates: Mutations and Appropriations in European Film Studies, 4. Amsterdam: Amsterdam University Press, 2014.

Van der Heijden, Tim. "Technostalgia of the Present: From Technologies of Memory to a Memory of Technologies," *NECSUS. European Journal of Media Studies* 4, no. 2 (2015): 103–121.

Van der Heijden, Tim. *Hybrid Histories: Technologies of Memory and the Cultural Dynamics of Home Movies, 1895–2005*. Maastricht: Maastricht University, 2018.

Van der Heijden, Tim, and Aleksander Kolkowski. *Doing Experimental Media Archaeology: Practice*. Berlin: De Gruyter, 2023.

Van Noortwijk, Annelies. "The Orbit and Single Shot Cinema." In *Exposing the Film Apparatus*, edited by Giovanna Fossati and Annie van den Oever, 130–139. Amsterdam: Amsterdam University Press, 2016.

Verhoeff, Nanna. *Mobile Screens: The Visual Regime of Navigation*. Amsterdam: Amsterdam University Press, 2012.

Venturini, S. "Technological Platforms." In *Preserving and Exhibiting Media Art. Challenges and Perspectives*, edited by J. Noordegraaf, V. Hediger, C. Saba and B. Le Maitre, 201–202. Amsterdam: Amsterdam University Press, 2013.

Virilio, Paul. *War and Cinema: The Logistics of Perception*. London: Verso, 1989.

Waldenfels, Bernhard. *Phänomenologie der Aufmerksamkeit*. Frankfurt am Main: Suhrkamp Verlag, 2004.

Waquet, Françoise. *Une histoire émotionnelle du savoir. XVIIe – XXIe siècle*. Paris: CNRS Éditions, 2019.

Ward, Montgomery. *Catalogue of Magic Lanterns, Stereopticons and Moving Picture Machines*. Chicago, IL: Montgomery Ward, 1898.

Wershler, Darren, Lori Emerson, and Jussi Parikka. *Lab Book. Situated Practices in Media Studies*. Minneapolis: University of Minnesota Press, 2022.

Wiesing, Lambert. "What are Media?" In *Technē / Technology. Researching Cinema and Media Technologies – their Development, Use, and Impact*, edited by Annie van den Oever, 93–104. Amsterdam: Amsterdam University Press, 2014.

Willemsen, Steven. "Widescreen Anamorphic Lens." In *Exposing the Film Apparatus*, eds. Giovanna Fossati and Annie van den Oever, 109–118. Amsterdam: Amsterdam University Press, 2016.

Winston, Brian. *Media Technology and Society: A History from the Telegraph to the Internet*. London: Routledge, 1998.

Winthrop-Young, Geoffrey, and Michael Wutz. "Translator's introduction: Friedrich Kittler and media discourse analysis." In *Gramophone, Film, Typewriter*, edited by Friedrich Kittler,

xi–xxxviii. Translated, with an Introduction, by G. Winthrop-Young and M. Wutz. Redwood City CA: Stanford University Press, 1999.

Winthrop-Young, G. *Kittler and the Media*. Cambridge: Polity, 2011.

Winthrop-Young, G., and Annie van den Oever. "Rethinking the Materiality of Technical Media: Friedrich Kittler, *Enfant Terrible* with a Rejuvenating Effect on Parental Discipline, a Dialogue." In *Technē / Technology. Researching Cinema and Media Technologies – their Development, Use, and Impact*, edited by Annie van den Oever, 219–239. Amsterdam: Amsterdam University Press, 2014.

Woodward, Ian, "Material Culture, Narratives and Social Performance. Objects in Contexts." In *Understanding Material Culture*, edited by Ian Woodward, 151–168. London: Sage, 2007.

Woolf, Virginia. *Orlando: A Biography*. London: Hogarth Press, 1928.

Woolgar, Steve. "Configuring the User: The Case of Usability Trials." In *Sociology of Monsters: Essays on Power, Technology, and Domination*, edited by John Law, 58–97. London: Routledge, 1991.

Wurtzler, Steve. "Standardizing Professionalism and Showmanship: The Performance of Motion Picture Projectionists During the Early Sync-Sound Era." In *Keyframes: Popular Cinema and Cultural Studies*, edited by Matthew Tinkcom and Amy Villarejo, 359–376. London: Routledge, 2001.

Yumibe, Joshua. "Film and Attraction: From Kinematography to Cinema." *Screen* 53, no. 4 (Winter 2012): 480–483.

Zielinski, Siegfried. *Deep Time of the Media. Toward an Archaeology of Hearing and Seeing by Technical Means* [originally published as *Archäologie der Medien: Zur Tiefenzeit des technischen Hörens und Sehens*, 2002]. Translated by Gloria Custance. Cambridge, MA: MIT Press, 2006).

Zielinski, Siegfried. "Media Archaeology". *CTheory*. 1996. [Online] https://journals.uvic.ca/index.php/ctheory/article/download/14321/5097 [last accessed 26.07.2022].

Index of Names*

Index of Subjects*