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The Digital Lab as Digital Milieu

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When King's Digital Lab (KDL) was established in late 2015, it was conceived as both a craft factory (working with colleagues to produce digital outputs) and a technical experiment (a site where the intersection of technology and the humanities could be explored). Significant progress has been made on both of those fronts: dozens of projects involving approximately £14 million worth of funding have been enabled, operational guidance documents (white papers) have been shared (KDL 2018; Ciula 2019; Smithies 2019), and research outputs have explored the intellectual and philosophical aspects of the laboratory environment (Ciula et al. 2023; Ciula and Smithies 2023; Smithies et al. 2019; Smithies and Ciula 2020). It is now possible, and the present volume represents a significant opportunity in this direction, to move beyond the software engineering and management techniques that enabled this success and use insights from the philosophy of technology to explore long-standing concerns in and around KDL about the role of technology in society and about the status of what in critical theory is termed, after Lewis Mumford (1934), "technics", thereby instantiating a productive dialogue across arts and humanities disciplines and challenging the still remarkably non-porous boundaries between C. P. Snow's "two cultures". In doing so, the laboratory has the potential to become a fully realised and ongoing applied techno-philosophical experiment. The goal is to move beyond the founding moment of the lab, intricated with modes of Silicon Valley utopianism and Agile engineering culture dominant at the time, towards modes of research and production more precisely tailored to the challenges of the present and future.

Emergence

This requires a radical rethinking of the ontological nature and epistemological potential of digital humanities (DH) laboratories and the technologies they use and create. DH labs are more than instrumental interventions into the corporate university (strategic deployments of the latest must-have capabilities) and should be much more than mere service centres for the production of digital research outputs. They are complex socio-technical entities that benefit from and support humanistic analysis, and benefit from and support an expanded conception of the human–technical interface. Gilles Deleuze and Félix Guattari (1988, 4) might view them

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as "assemblages" characterised by "multiplicities, lines, strata and segmentarities, lines of flight and intensities" that produce emergent phenomena. Significantly, such intensities, for Deleuze and Guattari, involve reaching into the "pre-individual" dimension, avoiding pre-set conceptions of the "Gestalt" or totalised figure of the human. Revealingly, Manuel Delanda suggests that such assemblages, which may have emergent potentialities, are irreducible to their component parts and immanent rather than transcendent; "the whole exists alongside the parts in the same ontological plane" (2016, 12–13).

In the densely packed environment of a DH laboratory this implies a potential flattening of the relationship between human and machine, with research and creativity emerging from a technoscientific fusion of "science, organization, and industry" (Latour 1999, 203). The poetics of flatness here, captured in Deleuze and Guattari's associated concept of the "plane of consistency" (1988, 9), applies both to the human–technical relationship and to the social conditions of the lab. Deleuze and Guattari's proposition that "Collective assemblages of enunciation function directly within machinic assemblages", suggesting the predominance of collective relationality over individual expression, deserves to be taken seriously and to be realised concretely (1988, 7, emphasis in the original). Digital technologies might be seen as a privileged case of this kind of assemblage, given their already networked, "assembled" nature, and as adding to and enriching the new materialist conception of distributed agency, which has focused substantially on human–animal relationalities (Massumi 2014; Parikka 2010), with a "multi-level approach" ranging from "the nonhuman to the human" (Hayles 2019, 196). What if the space and ethos of the digital lab were thought of as a flat sociality, where this implies a communitarian relationship between human and technical existence and a corresponding sense of non-hierarchical collective agency? Keeping with Marx, is there something to be learnt from the social life of (digital) machines, in other words from the ways in which they are owned and used, and the property relations they support? Can a transformative philosophy of praxis of Gramscian memory be put forward to conceive of a DH lab as a historical environment where technical objects and human subjectivity are taken to be in a relation of co-constitution? More crucially, perhaps, how might we address the tension between this vision of the collective or distributed agency and the individualistic bias of the contractual and labour conditions which underpin work in the early 21st-century academic environment and perhaps equally of the arguably humanistic bias of creative production in the arts and humanities disciplines?

This picture might be more challenging to some than the notion of a DH lab influenced by Silicon Valley culture and methods because it positions computer code and data models, algorithms, and websites on the same plane as humans—as actants in a socio-technical network—while also challenging the (auto-)immunity of the "human" in the "humanities"; such technophobia is misguided and arguably pernicious. Philosopher of technology Don Ihde notes that "human activity from time and across the diversity of cultures has always been technologically embedded" (Ihde 1990, 20). There is nothing alien about living in intimate proximity to technology. In this sense, the world of a DH laboratory should be conceived as

being as "natural" as a rainforest, brimming with life and interdependencies, a complex system that brings forth emergent outputs through interactions across its component parts.

Viewed in this manner, the products of DH lab environments are not so much built, as revealed or uncovered from the system. Martin Heidegger referred to this using the word "Entbergung", carrying the implication of unleashing or releasing from a conflictual (but natural) dynamic (Rutsky 1999, 6). It is an indeterminate emergent process bounded by the ontology of mathematics, electronic engineering, and human imagination. The potential of Heidegger's (1977) own thinking about "the question concerning technology" was arguably constrained by his ultimate recourse to poetry as the mode of revelation of the technical essence of man, but a different (and possibly stranger and more productive) epistemology is present in the work of thinkers who considered other "modes of existence", including French philosopher Gilbert Simondon's exploration of the "mode of existence of technical objects". In parallel with the recognition of an "entangled life" (Sheldrake 2020) in the natural sciences, these epistemologies can support the flattened sociality we are proposing.

The people who undertake technical development bear a considerable epistemological load in this context. Research Software Engineers (RSEs) working in DH laboratories design, develop, deploy, and maintain the set of conceptual tools, methods, data, and tacit knowledge that prompt the *entbergung* of humanities knowledge from the laboratory system, suggesting that they need to be elevated to a level of dignity within the academy not usually accorded to technical staff—and the modes of existence referred to earlier, both digital and technical, need to be made visible, tangible, and communicable. Simondon might have viewed RSEs as something like "the sociologist[s] and psychologist[s] of machines, [a] person[s] living in the midst of [a] society of technical beings as its responsible and creative conscience" (Simondon 1958/2017, 3). This was implicit in his elevation of technical objects to the same status as human subjects. Auxiliary to both Ihde and Martin Heidegger, Simondon claimed that there is an injustice in the relegation of technical objects to the status of mere instruments and an equal abuse in the elevation of the same objects to sacred status by technicians. Those who live and work in close proximity to technical objects and who have a deep sense of their functional beauty, the constraints and the humanity embedded within them, should in Simondon's view be accorded a significant pedagogic and quasi-political role as *mecanologues*, different from "mechanics", equipped to advocate and speak for and with the machines with which, or with whom, we coexist.

The socialisation of technical objects can thus be read as a means through which, rather than being rejected as inhuman, given up as inevitable, or abjected as inaesthetic, (digital) technical objects are accorded *droit de cité* in the field of the humanities. If they are interpreted as natural systems—in the sense of the environments of interactions where technologies are created and used, comprising RSEs and mecanologues—DH laboratories presumably need to be raised to the same status as (variously) academic departments, libraries, archives, or other components of contemporary scholarly life. Such a change of status raises all manner of

troubling epistemological issues but has the virtue of charting a course towards a mode of 21st-century humanities research that aims to exist in organic connection to the digital world, growing alongside it and shaping it with appropriate culture, methods, and values rather than being chained to it in a death spiral or as a mere functionary of the corporate university.

In light of this, there is abundant work in the wake of Heidegger and Simondon which will be required reading for the project of the DH lab as an experiment in human–technics inter-relations. The work of the late French philosopher Bernard Stiegler will be of prime importance. Perhaps closer to the concerns of KDL is the work of contemporary philosopher Yuk Hui (formerly Stiegler's doctoral student), whose work is informed by both Heidegger and Simondon and focuses among other things on the "existence of digital objects". Hui's proposition of the term "digital milieu" to account for the new forms of relationality and interaction with the digital which characterise contemporary life also bears much potential as a platform to think through the ontology and the sociality of the DH lab (Hui 2016, 47). "We are currently living in a digital milieu", writes Hui in the *incipit* of the first chapter of his *On the Existence of Digital Objects* (2016, 47), while Stiegler, prefacing the book, adds: "The digital object is utterly relational" (ix). Neither strictly "environment", nor "context", nor "system", the notion of "milieu", whose provenance Hui traces from 19th-century science, through German biologist Jakob von Uexküll, through Heidegger, and through the French epistemologist Georges Canguilhem, implies both structural relationality and subjective experience, thus a systematic and an existential ontology.

In the concluding section of his dense and compelling book, Hui proposes that if the first half of the 20th century "endeavoured to understand human existence ontologically", the "deconstruction" of this understanding in the second half led to an appreciation of the "prosthesis of technics", giving way to an ontology of the inhuman (2016, 248). This explains, for Hui, the prevalence of the term "system" (as in "information systems") over "milieu", ostensibly still too tied to biological life (as it is in von Uexküll). Hui's proposal, building on Simondon's "mecanological" proposition of the "associated milieu", is that we should now seek to understand the "milieu after systems", that is, to think the human and the inhuman, life and technics, in relation, to develop an ontology of their relationality and a practice and ethics attuned to it (248). Such an understanding, for both Steigler and Hui, can form the basis of a "new structure of care" (249). The ontology of the milieu and the ethos of care name the parameters for the future orientation of the DH lab.

This too-briefly sketched overview nevertheless underlines the larger point that more work (conceptual and technical) is needed to help us understand the complex relationships between technology and humanities research. Simondon, Stiegler, Hui, and others working in their orbit provide a radical ground from which to start, alongside contributions to Science and Technology Studies by Latour and the post-phenomenological tradition in the philosophy of technology initiated by Ihde (1990) and continued in various forms (Olsen et al. 2008; Verbeek 2010).

Somewhat in the same vein, though with a more accentuated ecological orientation (not without resonance with Hui's current "cosmotechnics" project), the

ethos we are advocating complements recent work by Katherine N. Hayles, who has explored subtle modes of cognition common to technology and plants as well as humans. In *Unthought*, Hayles noted that her term "cognitive nonconscious . . . crucially includes technical as well as human cognizers" (2017, 2). In her reading of technological systems, information, technical artefacts, and humans combine in assemblages to form a "planetary cognitive ecology" productive of indeterministic and epistemically complex outcomes. Her argument proceeds from this earth-scale perspective down to information theory as the smallest unit of analysis: referring to Simondon, Hayles suggests that "[digital] information in this view is not a statistical distribution of message elements but the result of embodied processes emerging from an organism's embeddedness within an environment" (24).

In tandem with ecology research in other humanities disciplines, but also under the pressure, so to speak, of the ethos of entanglement, the DH laboratory has a wider purchase as part of a move away from the arguably overly defensive anthropocentrism of the disciplinary humanities.[1] Hayles's concept of "nonconscious cognition", which recognises and accords value to processes of "integrating somatic, chemical, and electric signals to create a coherent body representation, discerning patterns too complex for consciousness to grasp, drawing inferences and creating anticipations from these patterns, and perhaps most importantly, processing information much faster than consciousness can" can, as she asserts, provide "a bridge between human, animal and technical cognitions" (2019, 182). Nonconscious cognition, in other words, draws from the deconstructive force of Deleuzian materialisms, in which everything is melted down to the energetic dynamics of flows and intensities, but allies it with a perspective in which cognition and agency are distributed along a "spectrum" (195), avoiding both the "total erasure" (182) of the human often implied in the expressions of the Deleuzian paradigm and the thesis of human and subjective mastery which are their critical target.

There is thus ample literature to support the view of DH laboratories as techno-philosophical experiments capable of modelling the full spectrum of human–digital interaction. We argue that this is where their primary value to the humanities lies, not only in the design and development of research outputs (as essential as that is) but in their contribution to the development of ontologies of the milieu and epistemological perspectives about our relationship to technology and the world. We can view DH laboratories like KDL, on the one hand, as concrete instantiations of Donna Haraway's "cyborg myth" "about transgressed boundaries, potent fusions, and dangerous possibilities which progressive people might explore as one part of needed political work" (Haraway 1991, 154), and on the other hand, as a privileged terrain on which to explore Hayles's proposal of a "continuum" of processes of nonconscious cognition (2019, 183). The fact they are deployed in the heart of the academy merely makes them more compelling and potentially transgressive. Rather than being conceived as service units for the delivery and maintenance of corporatised knowledge, DH laboratories should be positioned as radical interventions into the spaces that lie between the humanities, technology, science, and society.

Political Economy and Labour

It is important, nevertheless, not to lose sight of the political economy of DH laboratories and the labour rights of the people working in them in the act of intellectual experimentation. The conscious deployment of DH laboratories as techno-philosophical experiments (as with digital art collectives and open-access technology labs) implies a mode of activism that works against "a context in which efficiency, operationalism, and instrumental rationality are core values and market transactions the predominant social good" (Raley 2009, 6). It follows that the "human resources" aspects of the digital lab need to be rethought on the same terms, otherwise, the endeavour risks sinking into a form of theoretical utopianism. If research software engineering teams are viewed as sociologists and psychologists of machines, for example, there is no argument for them being employed (in the worst of worlds) as insecure gig workers at the grace and favour of corporate universities and mercurial funding bodies.

The ability to control the labour conditions and personal well-being of RSE teams is also, of course, heavily dependent on the wider funding and policy environment and, in the United Kingdom and many other countries, the requirement for universities to respond to market conditions. Post-Marxism, Rawlsian capitalism, or other pragmatic approaches are likely to be more effective in the realisation of stable and healthy labour conditions than unreconstructed modes of 20th-century labour politics, but it is nevertheless important to encourage experimentation and debate. At King's College London, the Faculty of Arts and Humanities continues to support a "socialised" lab from general finances, accepting the economic burden of permanent contracts and associated London allowance, pensions, travelling allowance and training funding, technical infrastructure, special equipment, etc., with an agreement that it will be offset to some degree by external grant income.[2] The Transparent Approach to Costing (TRAC) is used to measure the total cost of the lab and set a day rate capable of supporting high-quality contracts for the team, paid for by research grant funding from the United Kingdom and sometimes abroad.

Efforts are made to calibrate this complex mix against current and future funding schemes, the intellectual and career goals of colleagues, and the strategic visions of faculty and university management. It has become apparent, for example, that a degree of vertical structure will be needed to provide an interface between university administration and finance and the horizontal team of engineers that form the creative and technical heart of the lab: intellectual, political, and creative idealism will have to be blended with corporate pragmatism. We argue that, rather than being an unacceptable compromise, such an approach accepts the temporal and organisational situatedness of the lab. Whether it is conceived as post-Marxism or mere professional pragmatism, the goal is to enable (in a sustainable long-term manner) ongoing and potentially radical explorations of our techno-philosophical condition. As with the humanities generally, the goal must be to align our aspirations to planetary and geological (as well as organisational) time, if we are to truly do justice to our subject.

Regardless of the specific model adopted—inevitably a compromise between organisational and intellectual priorities—it must support human flourishing within the team and its associated projects. We believe this is possible within an appropriately theorised critical model. If we return to the experimental vision of the "assemblage" evoked here, for example, it is important to register that Deleuze and Guattari acknowledge the potential for the fluid and connective intensities they imagine to be folded back into more static and organised structures:

> One side of a machinic assemblage faces the strata, which doubtless make it a kind of organism, or signifying totality, or determination attributable to a subject; it also has a side facing a body without organs, which is continually dismantling the organism, causing asignifying particles or pure intensities to pass or circulate, and attributing to itself subjects that it leaves with nothing more than a name as the trace of an intensity.
>
> (1988, 4)

To translate this bivalent dynamic into the situation of a university DH lab might suggest something of the difficulty of the situation. Such labs are caught in a tension between the disciplinary and HR structures of the corporate university and a more future-oriented and potentially utopian vision of a porous human–technology relationship, in which DH lab staff have the same employment status, rights, and affordances as academics in disciplinary departments, themselves beset with similar challenges albeit of a different order.

The "subjectifying", or—more prosaically—author-centred tendencies of traditional arts and humanities research, determined in part by the history of disciplines and in part by the exigencies of individual career progression, might also mitigate against the collective ethos of the lab, arguably more resonant with the sciences. "Many people have a tree growing in their heads, but the brain itself is much more a grass than a tree", write Deleuze and Guattari (1988, 15), recognising that the "rhizomatic" thought they are advocating is inevitably in a struggle with the hierarchical structures and subjectivising impulses towards power-takeover (*prise de pouvoir*) implied in "tree-thinking". Despite significant advances in this respect, humanities disciplines, enshrined in the traditional organisational unit of the "Department", in perpetual conflict with higher authorities, and negotiating with the demands of the Research Excellence Framework or equivalent research assessments schemes in other countries than the UK, may conflate the technocratic discourse of the corporate institution with the Simondonian human–technics sociality evoked earlier, effectively throwing the baby out with the bathwater in their rejection of both. They may benefit, in their just defence of an open-ended research ethos, from the example of the DH lab.

What these cautionary notes might entail is a consciousness that the mode of existence of technical and digital objects, and the flat sociality outlined earlier, does not and cannot exist in a political vacuum and that a complex and subtle double consciousness of a kind is needed to negotiate a way through towards the socialised model of the DH lab we have outlined while keeping sight of the concrete issues of

sustainability, contracts, workloads, career opportunities, and "performance development". It would also be necessary to acknowledge that the "asignifying intensities" of Deleuze and Guattari or Hayles's "cognitive nonconscious" exist in tension with subjective impulses and the psychology of persons, so to speak. What this calls for is (i) thinking of the political economy of the refashioned DH lab adequate to its real-world situation in the neoliberal university; (ii) epistemologically articulate activism which can speak for and with the mode of existence of technical and digital objects, on the one hand, and the collectivity of the lab, on the other and; (iii) pragmatics, which embraces the singularity of each project, each conjuncture while keeping sight of what Deleuze and Guattari would call the "diagram" or "abstract machine" which can be extrapolated for a picture of the power relations which bear upon the life of research.

Modelling

The new vision for KDL—mediating humanistic, technological, and operational perspectives across the two-culture divide by means of assemblage theory and via conscious techno-philosophical experimentation—is anchored by the practical development of models using consciously designed and deployed modelling processes (of processes, data, workflows). These, in turn, and as well as being integral to the process of software design and development, are conceived as the residual artefacts of formal and informal reasoning strategies across disciplinary boundaries. Such is the centrality of modelling to the ethos of the lab that we claim special ontological as well as epistemological significance for it: we view it as "the process that kneads structure into the originating concept and determines its representational affordances", which in turn determine its utility for subsequent design and engineering processes (Smithies 2017, 174). It is only by accepting of common accord the indeterministic paradigm characterising the relationships between models of the world (theory) and the world of experience (truth) that genuine multi or interdisciplinary exchanges are achievable (Buzzetti, De Ninno, and Fiormonte 2021). In a more practical sense, mapping the relationships between components of a socio-technical system as complex as a DH laboratory is a difficult task that can be accomplished only using techniques innate to the system. This is made even more complicated if we accord technical objects as well as RSEs *droit de cité* in the wider academic system.

In the case of KDL, this is being achieved through the collaborative practice of modelling, inclusive of analysis, design, and development, from discrete fields in data structures through code, engineering processes, physical infrastructure, and conceptual architecture to human activities such as collaborative prototyping (explored in Rabea Kleymann's chapter in the present volume), team meetings, and planning processes. Significant elements of this work are already in place. Although this might sound pedestrian to the uninitiated, modelling reflects the deep integration of humans with the material and conceptual reality of software engineering as both technē and epistēmē that Simondon felt justified the emergence of the role of the mecanologue. In Hayles's words, "When objects join in

networks and interact/intraact with human partners, the potential for surprises and unexpected results increases exponentially" (2019, 197). In more prosaic terms, although KDL's *raison d'etre* has always been to enable the team and their colleagues across faculty to act as *homo faber* in the digital realm (primarily with the instrumentalist goal of producing research outputs), the ontology of the lab's milieu (entangling the modes of existence of RSEs, project partners, and technical objects) requires reflection upon and operationalisation of the lab as a human project even as necessary daily tasks proceed. The core challenge of the laboratory remains therefore to make the *homo poieticus* (Floridi 2013, 176) out of the *homo faber*[3] or in the less anthropocentric Simondonian terms, in "developing a technological culture" (Hui 2016, 58).

In this sense, as well as simply enabling their colleagues to produce required research outputs, KDL RSEs can be viewed as mecanologues equipped to advocate and speak for and with the machines they work alongside. Arguably, this identity is pre-digital and (rather than being alien to the humanities) evolved alongside principles that emerged in tandem with patterns found across the history of (all of) the humanities (Bod 2013, 2018). KDL's growing collection of models contribute to intellectual traditions developed over centuries, involving extensive production of technical "image-objects" such as philological stemma and other schemata created and tinkered with to make sense of patterns. In this sense, modelling exists as a mecanalogic language that mediates the elaboration of research outputs and their component parts from the fabric of all potential scholarly outputs. Rather than being alien to the humanities, computational methods (such as but not limited to modelling) evolved within the humanities tradition during and after the Enlightenment (and perhaps most powerfully for our purposes here, during the era of natural philosophy) as a way to formalise hypotheses based on logical schematisations informing deductive argumentation in natural language. In contemporary computer systems, these correspond to datasets and rules of inferences embedded in expert systems, but the humanistic lineage is deep (Buzzetti, De Ninno, and Fiormonte 2021).

It is important to recognise that the modelling tradition KDL contributes to is non-linear, still in evolution, and entangled with epistemological debates about the nature of knowledge and ways to best engineer knowledge systems. At this level, it intersects with topics as varied as indigenous knowledge representation and the philosophy of mind. Experimenting with the intelligence of machines means defining the world of experience as well as the models and the horizons of knowledge (Cardon, Cointet, and Mazières 2018, 1) and can be done well only with a critical awareness of the assemblages and wider milieu within which the modelling is taking place. It is only one aspect of the rich tapestry of humanistic practices that can be explored in DH laboratories, but RSE modelling clearly evokes Simondon's work of the technician in the form of a cycle of image-objects:

> The process of signification that unfolds in modelling activities . . . implies translation, negotiation and transformation of meaning. These transformations occur both in modelling processes engaged with an abstraction of

> complex phenomena into rule-based procedures . . . and in modelling directed at the re-integration . . . of the results of that reduction into interpretative frameworks such as explanatory diagrams and data visualisations.
>
> (Ciula et al. 2023)

KDL is therefore well positioned to showcase the indeterministic paradigm in action, combining hermeneutic modes of research with formalised modes of production beyond a strictly deductive model, inclusive of inductive, analogical, probabilistic, and iconic reasoning. This process can be viewed as the practical implementation and in some ways even a pragmatic demonstration of the kind of computational aesthetics outlined by Beatrice Fazi in *Contingent Computation* (2018), a complex evocation of "mecanologic" activity across humans and machines, resulting in consciously designed but often unexpected outcomes. Conceiving of RSEs as mecanologues working in partnerships with machines bursts the myth of hyper-rationalised computing wide open, by introducing uncertainty, the unexpected, and creativity to design and development. The role mecanologues could take in an AI/DH laboratory where technical objects are afforded the status of reflexive machines (Cardon, Cointet, and Mazières 2018) and the engineering of knowledge is modelled in systems architectures (hyperparameters or meta-models) rather than only linear and explicit data models is still relatively unexplored but suggests an exciting future.

Because of the nature of the milieu (pervaded by technical objects) they operate within RSEs are inclined to think eco-systemically and architecturally. Typically, they engage daily with multiple layers of technical systems (Ciula and Smithies 2023) featuring different degrees of "openness" and indeterminacy that need to be understood and acted with and upon. In addition to the normal process of research analysis, technical requirements elicitation, modelling (beyond only computational modelling and hence inclusive of functional prototyping as discussed in Ciula et al. 2023), and general software engineering, daily decisions can range from the choice of platform to produce websites analytics (entangled with issues of privacy and security) to the environmental footprint of cloud storage for projects datasets, and the cost of infrastructure for publicly funded research. In the KDL example, the lab set-up was informed by an ethos of care towards the results of previous investments (including a substantial share of public funding) which influenced the development of a holistic approach to sustainability (Ciula and Smithies 2023; Smithies et al. 2019) and continues to inform "responsible" building around architectural and systems choices. In this sense, an ethos of care can not only inform adequate labour conditions but also be embedded in modelling practices and influence technical strategy.

Cognisant of the ontology of its milieu and fuelled by an ethos of care, the techno-social lifeworld of the laboratory is operationalised across multiple vectors, symbolised most evocatively in Simondon's terms by detailed work to transition core infrastructure comprising hundreds of virtual machines housed in physical rack servers towards a more open and sustainable architecture based on the notion of collections as data (see Liu 2020) and (over the long term) from monolithic web applications towards containers, microservices, and modular code.

Higher-level "architectural" modelling, in concert with more detailed data modelling, is mediated and enabled by the lab's solution development team, informing the relationship of the lab's technical "stack" across to institutional services and national and international infrastructures. This higher-level modelling can be considered the glue that connects the core elements of the lab's socio-technical environment (namely data and systems) with its wider milieu, requiring or presupposing that double consciousness which in turn generates uncertainty, instability, and indeterminacy. At its core philosophical level, modelling is in this sense meaning-making, contingent and pragmatic, balancing functionalism (the product has to be produced and work) with meaning (the product has to make sense to address and inform research questions), and now—in KDL—the relationship of the laboratory's socio-technical core to the corporate university and beyond.

This productive tension is emblematic of the epistemological paradox inherent in any process of critical making and therefore in any research engaged with computational modelling, whereby the mecanologue is busy building things while also engaged in reflecting on her own practice. In so doing, she deflates the same models she builds (Ciula 2017), giving another spin to the creative process. Modelling enables scrutiny of the objects of analysis (whether they are predominantly material or conceptual) while keeping the means for that scrutiny (the apparatus for modelling inclusive of technical systems and objects) in focus. This multi-level approach to modelling aligns with Hui's analysis of Simondon in that "the technical apparatus—instrument is not only the medium that allows us to observe different levels of depth of a phenomenon but also a tool that bridges two different orders of magnitude" (Hui 2016, 30), corresponding to different levels of engineering abstractions and consequent mediated realities of experience. Opposite to oversimplifying (often referred to in pejorative terms as "overcoding") the objects of studies of the humanities, by designing, building, and maintaining digital technical objects RSEs juggle with their plural and immanent orders of magnitude.

Indeed, "Digital objects are at the same time logical statements and sources for the formation of networks. They are not only a philosophical conceptualisation but indeed concrete objects" (Hui 2016, 25). This double consciousness is pervasive throughout KDL, occurring in modelling activities and choices operating at the micro level of analysis of one particular object of research (e.g. the selection and tuning of an algorithm designed to train and measure textual variations) as well as in modelling performed at the architectural level of design and planning of a major national or international research infrastructure. Funding programmes such as the UKRI's Arts and Humanities Research Council "Towards a National Collection: Opening UK Heritage to the World" or "Research Infrastructure for Conservation and Heritage Science (RICHeS)" are examples of initiatives that require RSE expertise to move beyond point solutions and model infrastructure ecosystems where technical awareness is heightened, and models are shared and critiqued.

The wider digital humanities community are developing protocols to account for a variety of interpretative issues related to modelling (e.g. WE1S), and multiple platforms exist to expose datasets, version code, and reproduce experiments. In our view of the laboratory as a techno-philosophical experiment, KDL will contribute to this effort by envisioning methods of documentation and publication of

modelling processes and artefacts that account for the underlying analysis, design, and development work entangled with hermeneutic modes of research while at the same time producing functioning and executable modules. Such methods will not only acknowledge the ontology of functional and meaningful technical objects but align with holistic research integrity policies. More meaningful for the lab as milieu, it will ground our collective practice and aspirations in craft contributions that can also—through our combination of philosophical and technical reflection and our identification as mecanologues—shepherd the sustainability and long-term flourishing of ourselves and our community.

Conclusions

In the first part of this chapter, we observed how insights from the philosophy of technology can be used as a provocation to reconsider the intellectual and philosophical aspects of the digital humanities laboratory environment and in particular the relationships between human and technical existence in light of a flat sociality, a communitarian relationship, a non-hierarchical collective agency distributed and networked across the human and the non-human. In particular, we anchored our provocation to Simondon's notions of the mode of existence of technical objects for the machines and of the mecanologues for technical subjects who speak for and with those machines and encouraged a "natural" view of DH laboratories and associated RSE activity. What emerges is an epistemology for a DH laboratory resulting from the inter-relations and interactions that occur within its natural environment, more precisely defined using Hui's concept of digital milieu. In this view, which intersects with conversations about the relationship of DH and the humanities to environmental concerns (Linley 2016; Hörl 2021), the ontology of the milieu of the DH laboratory is both systematic (in the structural relationality of its components across the spectrum from human to non-human) and existential (in the subjective experience realised in those interactions and directed by an ethos of care).

Without dwelling further on the depths of this provocation, we gesture at how other more inclusive emerging ecologies could complement and enrich the achievement and study of what we see as the potential for DH laboratories to become fully realised and ongoing applied techno-philosophical experiments. Using KDL as our case in point, we subsequently contrasted the potential our provocation unveils, on one hand, with the contractual and labour conditions of the human subjects that interact at the most intimate level with digital technologies (Research Software Engineers as mecanologues) and on the other with the bias of the humanistic academy. Indeed, while the philosophical provocation we put forward draws an exciting picture of possibilities with respect to the radical interventions a DH laboratory such as KDL could unleash, these aspirations need to be aligned, not without inevitable and ongoing dissensus, with the temporal and organisational structures exemplified by the complexities of the KDL socialised lab and the political economy in the milieu of the corporate university.

The discourse on modelling allows us to close the circle of our provocation by suggesting how ontologies and epistemologies immanent to research software

engineering processes and practices can shed some light on what a DH laboratory as a human project could mean and, more akin to the inclusive ecologies we get inspiration from, on how to develop or repair our technological culture. Cognisant that our analysis creates parallels across different orders of magnitude, we claim that is exactly that multilevel approach to the networked milieu that humanistic research is equipped to engage with.

Nevertheless, in too many cases the outputs of humanities research—oblivious to the role and shape of technical objects—are impoverished and unethically overshadow the RSE labour that went into their production. It is important to recognise that, ultimately, what status we grant to technical objects in the humanities has implications for the status we grant to subjects. Our exhortation to accord technical objects *droit de cité* in the humanities, and the people who design, build, and maintain them the status of mecanologues, will sound strange to some readers. It challenges post-Cartesian notions of self and society to raise inanimate objects to a position of respect and to accept their entanglement with our daily lives and struggles. It also challenges the underlying paradigms which inform research funding applications and costing models, despite promising moves amongst funding councils towards greater flexibility and inclusivity in what is now being called "research culture" (Wellcome Trust 2021). But if we acknowledge the human ingenuity (the design effort, the creativity, the hope, the functionality) that is embedded in them and their pervasiveness not only in our lives but in the lives of millennia of people before us, we can come to view it as a necessity. The 21st century is upon us: we need techno-philosophical experiments like the one KDL is embarking upon to fully appreciate and chart future directions in our collective milieu. And we need people—mecanologues—willing to devote their careers to understanding and enabling that experiment across its full depth and breadth.

Notes

1 This issue has obvious intersections with debates related to posthumanities (see Braidotti 2013). That topic is outside the scope of this chapter but presents rich opportunities for research into the relationship of DH and DH RSE to contemporary theory.
2 At the time of writing, this Key Performance Indicator (KPI) was 60%, but there is general agreement this can and should be raised, along with the team's day rate, in keeping with accepted TRAC standards for research facility management in the United Kingdom. At the time of writing, this was under discussion with management.
3 "The real challenge facing *homo poieticus* is whether and how it might be possible to negotiate, in an ethically constructive way, a new alliance between physis and techne" (Floridi 2013, 176).

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