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Document Version

Publisher's PDF, also known as Version of record

Citation for published version (Harvard):

Griffin, G & Hayler, M 2018, 'Collaboration in Digital Humanities Research – Persisting Silences', *Digital Humanities Quarterly*, vol. 12, no. 1.

[Link to publication on Research at Birmingham portal](#)

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DHQ: Digital Humanities Quarterly

Editorial

Collaboration in Digital Humanities Research – Persisting Silences

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Abstract

Collaboration has become a hallmark of Digital Humanities (DH) research. Nonetheless it remains under-discussed and for those not deeply engaged in DH a bit of a mystery. Drawing on recent DH work and publications that engage with questions of DH collaboration in different ways (e.g. [Deegan and McCarthy] [Griffin and Hayler 2016] [Hayler and Griffin 2016]), we analyse three types of DH collaboration: 1) human-human interactions; 2) human-machine/material interactions; and 3) machine/material-machine/material interactions. We argue that engagement with collaboration processes and practices enables us to think through how DH tools and practices reinforce, resist, shape, and encode material realities which both pre-exist, and are co-produced by them. We suggest that understanding these entanglements facilitates a critical DH in which academic hierarchies and disciplinary preconceptions are challenged.

Collaboration has become a hallmark of Digital Humanities (DH) research [Nowwiskie 2012], with scholars either actively engaging with various parties across and outside of the university or becoming increasingly aware that this is what they should be, or are at least expected to be, doing. In the European survey on scholarly practices and digital needs in the arts and humanities [Costis et al. 2017, 6], for example, seven out of ten Digital Humanities researchers said they "often or very often" engage in collaboration. Nonetheless, or perhaps because of this generalized practice, collaboration has become increasingly taken for granted. However, we would like to suggest that it remains under-developed in both theory and practice, particularly with regard to partnerships that occur between academic and non-academic (typically technical) collaborators and between human and non-human actors (which, we argue, might productively be thought of as collaborators in the co-production of certain resources and forms of knowledge). Collaboration in DH research has not been ignored,^[1] but it is still under-discussed in the field, particularly with regard to its diversity and subtlety. This can lead to particular kinds of omission in the discourse around collaborative projects.

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We were reminded of this during 2014-15 when we co-edited two volumes on *Research Methods for Digital Humanities* – one on "reading" digital data [Griffin and Hayler 2016], the other on "creating and curating" such data [Hayler and Griffin 2016]. The aim of these volumes was to capture some sense of the range of research methods that contribute to the Digital Humanities. We therefore asked our contributors to discuss the research process of actual DH projects they had undertaken, and expected that many of the chapters would include some discussion of the collaboration processes integral to that work. But, to our surprise, despite the fascinating accounts of DH research we received, we were largely met with silence, and even active resistance, to this topic. When we tried to elicit more sustained accounts of collaboration, one contributor emailed the following:

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The way I/we see it, DH is not a method. It is an explorative field of research where we use digital tools and materials to revisit and map out new ways in the motley field of humanities, with its many different disciplines, often described as a big tent. We try to capture some of this richness in our chapter by addressing central methodological issues we see in different practices in [our disciplinary field]. Going into technical detail in one project is not in our interest, and we do not think it will be useful for the readers of your book to get a detailed technical account when entering a field of constant technological development. What we focus on is rather to set forth more longlasting opportunities and challenges. (Email communication to Griffin and Hayler, 5/6/2015)^[2]

We certainly have some sympathy with the view that DH is not simply a method, or set of methods, though some processes and practices have certainly come to typify the field as it stands. The contributor above reinterpreted our request for more detail on the nature of their collaborations as meaning a 'detailed technical account' which they did not want to provide. When we wrote the introduction to *Research Methods for Creating and Curating Digital Data in the Digital Humanities* we therefore noted:

As all the contributions to this volume indicate, digitising and curating digital data is a collaborative effort involving multiple disciplines, skills and tools... [but] the engagement with technicians, technology experts, and technologies is often left unaddressed...Indeed, it can be surprisingly difficult to get experienced researchers to discuss this dimension of their work. [Hayler and Griffin 2016, 3]

How, then, might one promote a rich discussion of collaboration? A useful approach can be found in Marilyn Deegan and Willard McCarthy's collection *Collaborative Research in the Digital Humanities* [Deegan and McCarthy]. The contributions to this volume provide an extremely varied range of interpretations of what it means to "collaborate", that also offers at least a partial index of the academic cultures within which such interpretations are made. We therefore take the diversity of approaches of our own two volumes, alongside those in Deegan and McCarthy's text, as our point of departure. In this article we do three things: we begin with a brief typology of collaborations within the Digital Humanities and then analyse the terms in which the types of collaborations we identify tend to be discussed by DH scholars, emphasizing the present limits of the discourse whilst also highlighting existing best practice. We conclude by exploring some reasons for, and ways in which, more nuanced descriptions of collaboration become silenced, and by re-emphasizing why such rich elaborations of collaborative research are vital for scholarship and pedagogy in the Digital Humanities. Throughout, we suggest that paying attention to the complexities of collaboration in DH research has the potential to a) broaden the community base, b) strengthen its presence in universities, c) demystify its processes, and d) further build an (at times posthuman) understanding of how different actors, human and non-human, come together in DH collaborations. This last point establishes what we might also more deeply learn from studies of collaboration: knowledge is very rarely, if ever, produced by individual human beings; coproduction is the typical experience and we politically, pedagogically, and practically need a better language for articulating this reality.

Typologies of Collaboration

Collaboration, as a topic, is both normalized and widely discussed by many fields. It is also a practice that is continuously engaged with, either directly or indirectly, by all scholars, since their work a) dialogues with other work and hence with other scholars, and b) near ubiquitously relies on computers for searches, production, storage, and retrieval. In this section we therefore do not claim uniqueness in terms of collaboration underpinning DH, but rather address some of the features of collaboration that have specific salience for DH. We highlight this because the image of the lone Humanities scholar, frequently referenced in discussions of DH collaboration [McCarthy 2005] [McCarthy 2012] [Rockwell 2012, 135], is receding as research funders increasingly call for collaborative research projects,^[3] as universities in many countries continue to, or start to, base scholars in research clusters, centres, or similar groupings, and as the "impact" agenda of the Research Excellence Framework (REF) in the UK^[4] demands engagement^[5] with stakeholders and partners beyond the immediate academic context.^[6]

Collaboration has thus gradually come to be a demand, if not an explicit necessity, for Humanities scholars, even as many types of research audit, including the REF, consider their work predominantly in terms of individual and individualized outputs. Such tensions offer one reason for the necessity of addressing collaborations at this time, not least in fields such as Digital Humanities where collaboration is considered, by many, to be a prerequisite.

Collaboration is a complex, intersectional activity in which multiple forms of co-working often occur simultaneously, even as they are differentially privileged, acknowledged or, as in some instances, not acknowledged at all. Such practices of cworking might include:

- Various kinds of disciplinary, and cross-disciplinary, collaborations, e.g. with colleagues in the same field, with colleagues from a different field within the same knowledge domain, or with colleagues in a different knowledge domain.
- Collaborations, as above, with people who are not colleagues, both inside and outside of the university.
- Collaborations across different locations: co-locational, in different places within the same culture, or in different places in diverse cultures (academic, national, international etc.).
- Various intensities of collaboration: e.g. close-continuous; close-intermittent; superficial-continuous; superficial-intermittent; one-off or repeat; etc.
- Different kinds of collaboration between human and non-human actors (this latter typically being machines (hardware) and/or processes (e.g. software)).

Such collaborations may also be described in terms of specific dimensions such as communication patterns. Clay Shirky [Shirky 2003], for example, suggests three types of communication patterns particularly associated with online interactions and which might be used to identify types of collaboration:

- Point-to-point, two-way (as in a Skype call).
- One-to-many, outbound (as in newsletters).
- Many-to-many, two-way (web fora and other online group discussions).

To this list one might also add many-to-one, inbound (for instance in crowdsourcing), and possibly others. Shirkey's typology is based on human-human interaction, where each set is defined by the number of contributing actants involved and the direction of the most prominent flow of information. In contrast, Timothy Butler and David Coleman [Butler and Coleman 2003] put forward five fundamental models of collaboration, defined instead by how information and knowledge are generated:

- Library (a few people place material in a repository, many draw on it).
- Solicitation (a few people place requests, many respond e.g. a Request for Proposal system, or crowdsourcing).
- Team (a small group working together on a project).
- Community (e.g. a Community of Practice).
- Process Support (systems that support repetitive workflows).

By focusing on the production, rather than just the spread of knowledge, Butler and Coleman introduce the potential for explicitly including non-human actants in models of collaboration.

Typologies, such as those above, are useful in elucidating specific aspects of Digital Humanities work. They provide a theoretical, analytical framework for thinking about collaboration rather than mapping its entangled realities. Here, we would like to propose a different typology, designed to capture not just the communication or generation of knowledge, but rather a meta-level focus on all manner of interactions between actants in digital contexts. Such interactions, as outlined, are direction neutral and allow for discussions of the travel of information along any or all routes between collaborators. In this way, interactions can be divided into:

1. Human-human interactions
2. Human-machine/material interactions
3. Machine/material-machine/material interactions

Of these three types of interaction, the first and the second are discussed most often within analyses of DH collaboration, though we would argue that their full complexity is often overlooked. The third is, currently, the least discussed, but requires further development in response to various new approaches to materialism across the Humanities. Below we expand on each in turn, focusing on the particular frame of academic DH research. It is worth noting at the outset that this is an idealized framework; collaborations often, maybe always, transgress the divisions shown above, with non-human actants influencing human-human collaborations, which then reshape the non-human sphere in turn. Collaboration, as we conceive of it, is truly entangled, developing over time in ways which are complex to track. The proposed typology, therefore, does not describe every collaboration, but rather elements that might appear in every collaborative act.

Human-Human Interaction

Human-human interaction may refer to researchers and other partners who are collaborating in producing and/or "farming" data in a joint project, or to the connection between those who have produced Digital Humanities resources and those resources' end users (we see it as valuable to view such interactions as collaborative precisely because they can result in the co-production of knowledge). Collaboration between human actors is always affected by the experiences and backgrounds from which such actors join the collaboration^[7], and in academic work this is typically most clearly seen in disciplinary divisions. In "Being the Other", for example, Melissa Terras discusses the relationship between Humanities scholars and their collaborators from Computing or Engineering Science working on DH projects [Terras 2012]. Terras argues that in such cross-disciplinary collaborations, "individuals...often find they are the 'Other'" [Terras 2012, 213], i.e. they experience a profound sense of their own difference as their work is defamiliarised – they are no longer "normal". With both sides destabilized in this manner, there comes "the need for the construction of roles and responsibilities that allow their skill sets to be admitted to a working team" [Terras 2012, 213]. The team thus often needs to be built from first principles, emphasizing the skills that brought the collaborators together whilst minimizing the friction of competing disciplinary norms (and, indeed, establishing new norms that future collaborations may benefit from deploying). For anyone experienced in interdisciplinary collaboration, there is little that is surprising here, and yet such experiences of alterity, and its legitimate and frequent challenges, are often forgotten or left unarticulated, rendering them as a surprise for each new generation of scholars who might therefore reasonably feel that they, alone, encounter such difficulties.

Terras' notion of "otherness" has strong resonances with feminist methodological work from the 1980s and 1990s where questions of "what counts" (what knowledge, what skills, what experience etc.) were key to debates about the status of women in the academy and in knowledge production (see e.g. [Harding 1987] [Hartsock 1998]). Underlying such questions of "what counts" are (often deep-seated) inequalities, more or less consciously acknowledged hierarchies of knowledge, method, and practice that have led Willard McCarthy to suggest that "true collaboration within a group happens rarely" because it requires an "un-boss", someone, according to McCarthy, who is "*primus inter pares*", i.e. an actor able to make calls on what is valid and yet able to step back and allow others to lead and act as the work demands [McCarthy 2012, 2]. This is no easy task.

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The very notion of a *primus inter pares* indicates power differences, and therefore issues of leadership and of equality which also deeply troubled feminist research when the discipline of Women's or Gender Studies was seeking to establish and legitimize its work in academia (just as DH has been doing, in its current form, since around the turn of the century). The early feminist demands for the recognition of equality within knowledge production were very much concerned with the inclusion of women in the academy (e.g. #gluck1991); the recognition of the co-production of knowledge between researchers and those researched #oakley1981, and an attendant reduction in the assumptions of power differences between these; and the inclusion and support of diverse research methods and processes. In a similar fashion, most of the current debates in the Digital Humanities about status, "being the other", inclusion, legitimation, and support revolve around status markers and power differentials between different kinds of knowledge workers, and in particular between a) those who are Humanities scholars and those who come from a technology or engineering background, and b) academic and non-academic partners (there can be, and often are, overlaps between a) and b)).

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In "No Job for Techies", for example, John Bradley discusses how the construction of technical staff as "support services" tends to figure these staff as occupying marginal or secondary roles (the "secretaries" or services providers – in feminist terms – of DH), and "the diminutive term 'techie'" frequently reinforces that relegation [Bradley 2012, 11]. Bradley addresses this tendency directly in terms of power, arguing that in software development the need to involve the external user in software design constitutes a model form of power sharing that is often ignored [Bradley 2012, 17]. Unsurprisingly, given the emphasis on individual research publications in the UK, Bradley argues that one way to change entrenched power structures within the Digital Humanities is by "getting status for [technicians' work] by framing it in the context of doing research...[i.e.] reporting the results by writing about them" [Bradley 2012, 18]. He himself reports directly on the 2008 Research Assessment Exercise and on the "research outputs" that King's College London submitted, even though there was no separate panel for Digital Humanities (as was also the case for Women's and Gender Studies in their beginnings, and was again the case in the most recent such exercise in 2014). The desirability of submitting to such exercises in order to gain status is certainly up for debate, but here we want to focus on the fact that Bradley's discussion of power differences among staff involved in DH projects explicitly recognizes status differences and inequalities between academic and "professional" staff (his terms) as one of the central issues in DH collaboration. This may also work the opposite way, for instance when technical staff are "the experts" that understand how to "translate" a potential project into digital form, not least as the requirement of complex digital work becomes the norm in research projects, with masculinized tech workers dominating institutional discussions, and commanding spending decisions, over a feminized academic class (not least as these gendered differences often manifest as gender differences).

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Bradley's discussion of "alt-ac" [Croxall 2012] jobs constitutes another articulation on this topic, showing how DH workers can become marginalized through the denigration of certain kinds of expertise. Power differentials may manifest themselves in myriad ways. Bradley's fundamental point holds across them all; however, power structures both within and beyond the immediate interactions can lead to the work of one or more collaborators being reduced or going uncredited, and to the detriment of their institutional and subject standing.

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It is important to realize that one way in which such differences can be articulated is by remaining silent about their processes, thus side-lining, or invisibilizing, certain categories of workers in DH or academe more broadly; silence is also a form of articulation – it speaks. This is a point that we will return to.

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In different terms, Julia Flanders explores the power dynamics in human-human DH research practices, suggesting that "collaboration...is always understood to carry with it some kind of sacrifice, a trade-off between autonomy and synergy" [Flanders 2012, 67]. The vocabulary which characterizes her essay, from "*sacrifice*" to the "intensification of] the *concessions* we make to the demands of the social contract" and the voluntary *submission* "to norms of behavior and *constraints* on our freedom of action" [Flanders 2012, 67]^[8], further contribute to the sense of an agonistic relation [Mouffe 2016]. This is confirmed in Flanders' assertion that DH is "a domain...where we see, *locked in struggle*, the drive towards absolute consistency and technical processability on the one hand, and the drive towards critical

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independence and disciplinary debate on the other" [Flanders 2012, 68]^[9]. Given this agonistic relation, Flanders suggests that "our instinct may thus be...to treat disciplinary debate as the opponent: something that needs to be eliminated or ignored in order for collaboration to proceed" [Flanders 2012, 70]. But in this drive we might also (often) find the loss of exactly the diversity across disciplines which makes collaborative work so desirable – the same friction which produces hierarchical thinking, factions, and the need for McCarty's "primus inter pares" might also be marshaled, instead, to produce the new thinking required to solve a problem or spot the absences produced by particular knowledge domains' norms and traditions. Such solutions might well end up contributing to the very consistency and processability that their necessary friction is so often positioned as inhibiting. Flanders' own response, to move beyond a survival-of-the-fittest model of approaches to intellectual labour, is to try to define "the precise role of dissent within our collaborative ecology" [Flanders 2012, 70]. We would endorse this approach. By increasing the understanding of what each discipline offers to the collaboration *through* rather than *despite* its difference, otherness becomes a tool for potentially overcoming technical, theoretical, and/or creative problems. Brian Rosenblum and Arienne Dwyer report positively about their collaboration in "Copiloting a Digital Humanities Center: A Critical Reflection on a LibrariesAcademic Partnership" [Rosenblum and Dwyer 2016]. Although fully aware of the cultural differences between the library as a service provider and being an academic as research-oriented, they cite the differences between them as enabling them to "brainstorm creatively, problem-solve efficiently, fill in each other's disciplinary knowledge gaps, and alternate taking the lead on any given activity" [Rosenblum and Dwyer 2016, 120].

Where Flanders looks at human-human DH collaboration in terms of a quasi-evolutionary social politics, Geoffrey Rockwell discusses it as a relative challenge, "not, I believe, to traditional individual research, but to the organization of professional scholarship in general" [Rockwell 2012, 151]. Writing from a North American context, he distinguishes between "the professoriate" and "amateur researchers" (terms redolent of earlier notions such as the "gentleman scholar"), proposing that "while we never believed that the professoriate should have special legal privileges, we have acted as if we were a special caste of intellectual worker who should be supported by society and protected with administrative mechanisms like tenure" [Rockwell 2012, 151]. Such a statement, which also articulates power differentials of the same order as those discussed above, seems somewhat surprising in 2017. In describing the supposed challenge that will occur when "the distinction between the professoriate and amateur researchers...blur[s] as more and more research is shared through social media" [Rockwell 2012, 15], Rockwell inadvertently (we assume) re-asserts the power and status differentials that he regards as being threatened. The reader feels transported back in time when Rockwell claims that "crowdsourcing projects provide structured ways to involve the growing numbers of well-educated amateurs with time on their hands. . . Such projects . . . provide educated amateurs with a meaningful way to use their leisure time" [Rockwell 2012, 151–2] – in other words, a form of "rational recreation" as advocated in the 19th century to contain and control unruly workers and amateur researchers. Far from recognizing a challenge to the standing of the "professoriate," this manner of speaking reproduces certain conventions with regard to who is expected to have power and who is seen to be any knowledge production's final arbiter and owner. Rockwell, overall, endorses co-production with the "crowd," but established, arboreal hierarchies remain the norm over more rhizomic understandings of the generation of work. One might put a very simple question: if research could not be produced without the crowd, does it make any sense to diminish their contribution, or to see the academic as working in isolation and merely facilitated by an instrumentalized general public, the crowd figured as a neutral tool (i.e. something put to predictable ends with no effects of their own)? We discuss the (im)possibility of neutral instrumentalization below in the section on machine/material-machine/material interactions, but, as Gabriel Wolfenstein's chapter on crowdsourcing shows (see below), it is a mistake to view the crowds that are sourced as un-invested or as purely, or neatly, a means to a research end [Wolfenstein 2016].

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Thinking through another aspect of the ways in which power structures can be written into co-production, Melissa Terras' work on otherness in DH [Terras 2012] is also amongst the most forthcoming in discussing the vicissitudes of DH collaboration. As she writes: "I have encountered my fair share of disasters. Shall I be honest? Things have gone horrendously wrong, often between individuals who are supposed to be working closely together" [Terras 2012, 222]. Terras suggests that:

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Most failures in projects...stem from a lack of communication. Perceived slights of status or disputed 'ownership' of published outcomes have ruined what promised to be an interesting and fruitful working relationship. Those employed to do complex computational tasks have not had the desired skill set after all, meaning deliverables are not delivered. [Terras 2012, 222]

What Terras brings out here is that power hierarchies not only shape research, but that they are able to do so by pressuring collaborators into promising too much, or blinding them to the complexity of projects that rely on still-new methods and practices.

Terras is the only writer in Deegan and McCarty's collection who explicitly names the disasters that might occur in human-human interactions in DH research:

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There was research which had to be abandoned after months of statistical analysis because a party forgot to mention a dataset that should have been included...There was the time when the research assistant set out to sabotage a project because she did not believe in a professor's expertise, and the one about the research assistant who suddenly left because the pressure was too much, taking passwords with them. [Terras 2012, 223]

In recounting these anecdotes, Terras shows a willingness to be honest about the challenges and failures of human-human collaboration, the documentation of which is both rare and yet absolutely necessary in order to move collaborative research forward.^[10] The more that potential collaborators can learn from previous work, the more likely their own chances of success, and this learning cannot come from solely positive stories; the negative results of work slowed, distorted, or abandoned may have just as much to tell collaborators as the documentation of successful projects. Hence our desire, expressed above, for our own collections on research methods to include the realities of the work undertaken.

Terras' litany of what can go wrong can seem depressing, and her assertion that "The biggest issue...with many ambitious digital humanities projects...is the lack of identifiable outcomes at the close of a project which were promised at their start" is, in some respects, deeply worrying [Terras 2012, 223]. But, whilst we did not find the lack of identifiable outcomes that Terras describes in the volume we edited on *Research Methods for Creating and Curating Data in the Digital Humanities* [Hayler and Griffin 2016], that volume's contributions did also indicate that not everything always went to plan. Mats Deutschmann, Anders Steinvall, and Anna Lagerström's chapter on "Raising Language Awareness Using Digital Media: Methods for Revealing Linguistic Stereotyping", for example, details how voice manipulation through voice morphing software (intended to manipulate the way that participants read subjects' gender) always sounded artificial and thus made it difficult to know if participants' responses to the voices that they heard were due to the particular characteristics of a voice, such as sounding "female/feminine", or to the "unnaturalness" or artificiality of the voice's tone [Deutschmann et al. 2016]. This is an important finding, not only because it points to a key issue in technological embodiment, namely how to make the non-human seem convincingly human, but it also highlights that a significant proportion of DH research is currently exploratory in nature, both in its research questions, but also in its emerging methodologies and technical requirements. Hence Deutschmann et al's findings cannot be described as "negative" or as leaving them with "nothing to show for their efforts". Rather, they offer (in a similar way to Terras) a particular result in a chain of work that may eventually lead to better voice morphing technology and hence to better ways of teaching people about the effects of the particularities of voice on the hearer.

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Where discussions of interactions in DH research between human colleagues reveal some of the tensions and power struggles between peers from diverse disciplinary backgrounds, such struggles can be less immediately obvious when collaborations are more remote, as in the context of crowd-sourcing, or when producing DH tools or databases for end users who may remain completely unknown to these products' producers. Like a number of contributors to *Collaborative Research in the Digital Humanities*, Susan Hockey (2012), in "Digital Humanities in the Age of the Internet: Reaching Out to Other Communities", takes a research assessment-driven view of these "outreach activities", where reaching out to "wider society" and "developing links with a broader range of organisations" [Hockey 2012, 90] is construed as a means of academic survival. Highlighting the expense of large Digital Humanities projects, Hockey uses the phrase "indirect collaboration" to describe the "re-usability" of data and tools produced in the academy that find application and use outside of that space, although she also argues that "the humanities computing community has not been particularly good at promoting its activities beyond academia" [Hockey 2012, 90].

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There is a way in which, in the neoliberal terms that Hockey's chapter itself uses, what she writes about are "derivatives": asynchronous uses of data and tools by a "wider", hence unknown, public. This form of collaboration is cast as a supply-and-demand structure where academics act as producers and "wider society" (amorphously construed) as consumers. There is no immediate interaction except via the machine, i.e. this collaborative mode pushes at the boundaries of human-human contact, though we would argue that such contact is *mediated* by the secondary and simultaneous human-machine/material interaction rather than wholly replaced by it; in terms of the use of tools to produce knowledge, there is a useful sense in which the producers of the tool and the end user co-produce the final output, with the producers' share of the input being hugely variable across different projects and tools. This also further reveals that our typology of interactions does not describe research activity in mutually exclusive terms – interactions between actants nearly always overlap and co-shape one another, for example where academic transdisciplinary partnerships intersect with interactions with technicians recruited to facilitate such new collegiate research and the equipment that they bring to such tasks.

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Somewhere between the intimacies of collegial collaboration that are most often discussed and the distanced collaborations described by Hockey sits crowdsourcing. As Gabriel Wolfenstein has argued, "knowing your crowd" is key; here collaboration is about the give and take between researchers and researched, or knowledge owners [Wolfenstein 2016]. Wolfenstein offers an illuminating account of how the project *Living with the Railroads*^[11] required sustained engagement with the rail fan community, guaranteed well beyond the lifetime of the project, in order to gain access to the materials held in the community. This investment was achieved by inviting several rail fans onto the Crowdsourcing Trains Advisory Board. These members, and the wider fan community, were then encouraged to act both as sources for core material for the project and as end users. This virtuous circle was both enabling and productive, but it required long-term commitment outside of the explicit project parameters. One might wonder to what extent there is an appetite for this kind of commitment amongst academics who may not regard crowd-sourcing as the collaborative co-production of research, but rather as the potential to draw on existing communities as an instrumentalized resource, i.e. as another tool for getting research done and nothing more.

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In considering discussions of human-human interaction in DH research collaboration, it is noteworthy that concerns frequently relate to status, primarily the relative status of collaborators in terms of pre-existing disciplinary and functional hierarchies, the standing of those people within their research communities and collaborations, and the perceptions of such from outside. For UK academics, collaboration is often filtered through the lens of the REF which, in many respects, does not favour collaboration. In this environment, technicians and non-academic partners can be constructed as "second-class citizens", the feminized servants of the collaboration process who simply facilitate the "real" academic work. But such attitudes may well contribute to the kinds of failures that Terras describes and are, if nothing else, inaccurate.

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Collaboration is fraught, achieved against and despite odds [Griffin et al. 2013]. Such odds include, inter alia, the reliability of those with whom one works. The realities of skillsets requirements are also always coupled with collaborators' views of their and their co-researchers' social standing and relative merits, and all of this is further intensified by the realities of a neoliberal research landscape (which might be thought of as a prickly and jealous collaborator in its own right, such is the profundity of its effect on final outputs) and the still-present support of colleagues and co-conspirators. Such factors, positive and negative, could be expected to be less evident in the human/material-machine collaborations to which we now turn, but non-human actants, as we shall see, are also never neutral – they bring their own frictions.

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Human/material-machine collaboration

Since the late 1970s, we have seen the gradual emergence of new materialisms, developed from (most explicitly) Bruno Latour's and Steve Woolgar's *Laboratory Life* [Latour and Woolgar 1979], Latour's *Science in Action* [Latour 1987], Donna Haraway's *Simians, Cyborgs and Women* [Haraway 1991], and Andrew Pickering's *The Mangle of Practice* [Pickering 1995].^[12] The questions asked by Latour's networks of human and non-human actants, Pickering's mangle of humans and their tools, Haraway's cyborgs, Jane Bennett's entangled vibrant matter [Bennett 2010], and what Karen Barad terms the "intra-action" of humans and matter have dramatically changed perceptions of materiality and nonhuman agency in human affairs [Barad 2007]. There is now an increasing recognition of how materiality shapes and circumscribes human action in entangled processes and/or complex systems, rather than human-machine/material intra-action being a one-way street with humans exclusively setting the direction. With work in DH exploring tools alongside texts, we argue that an understanding of machines as collaborators in knowledge production, and an awareness of the impacts of materiality on such production, becomes a disciplinary as well as philosophical concern. Materials and machines materialize; new materialisms conceive of matter as exhibiting agency [Coole and Frost 2010, 7] and resonate with posthuman philosophies aimed at moving an understanding of human action from impositions of human will on inert stuff to contextualized and contingent processes in intra-action with lively matter. Such recognition challenges any understanding of collaboration as a solely human activity; it demands that we conceive of the agency of the material/machine, a fact to which DH scholars pay some, but still limited, attention. This is evident, for instance, in Cecilia Lindhé et al.'s chapter for us on "Curating Mary Digitally", concerned with the question of how medieval representations of Mary might be effectively remediated digitally [Lindhé et al. 2016]. Lindhé et al. accept N. Katherine Hayles', and others', assertion that "the remediation and organization of knowledge shapes our thoughts and actions" [Lindhé et al. 2016, 142], and for that reason the team wanted to move away from a simply mimetic reconstruction of representations of Mary. Instead they decided to "direct attention to physical interaction and to the materiality of the work" [Lindhé et al. 2016, 147], substituting mimesis with the creation of digital interfaces that reacted to their viewers' movements. Whilst this approach shifts attention from the work as product to the work as a text produced in the process of viewing, it does not inherently move away from attributing the primary or dominant agency to the human. The reproductions are seemingly given some active role, but it is the viewers' movements that determine

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what is seen; the performance aspect of the exhibition grants the material a secondary agency that remains subsidiary to the human viewer. Lindhé et al. offer a great model of the kind of approach that can lead to matter being made more obviously vibrant in the digital display of artworks, but in this work the object's most visible agency remains parasitic off human input. Such an approach was important for the team since they explicitly wanted to privilege the aesthetic and humanistic over the technological, following Johanna Drucker's injunction not to be overwhelmed by computational methods, or to grant them primacy [Drucker 2009]. Lindhé et al.'s work shows how digitization can be deployed in producing new and conscious efforts to reframe materiality, but it also signals the continued struggle over how the human and the material might be integrated, or conceived of as integrated, without having to hierarchize their roles. In any interaction there may always be a dominant actant (or actants); in Latour's terms, they are equally actors even if they do not act equally. The challenge comes in materializing the real agency of actants which are not human such that we might better realize the complex roles that they can play in the co-production of knowledge and experience.

Non-human agency has increasingly made its way into Digital Humanities work concerned with the effects, typically on reading, of the materiality of media. The work of Hayles ([Hayles 2002] [Hayles 2012]), Kirschenbaum [Kirschenbaum 2008], and Hansen [Hansen 2006] has been hugely influential in this regard, setting the terms for why a richer understanding of materiality might be important for DH. For our purposes here, such understanding may refer to the collaborations between the producer and the tools of production, the producer and the digital product, or between the product and its user.

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Matt Hayler, for example, uses the resistance to the new materiality of ereading devices, such as the Kindle and the iPad, to underpin a postphenomenological^[13] philosophy of technical practice in his *Challenging the Phenomena of Technology* [Hayler 2016a]. In our collection on reading digital data, Hayler explores the particular relevance of materiality to DH research into reading, from hyperlinks producing specific kinds of reading practices on screen to the distinctive physicalities and entailed effects of paper and electronic page spaces [Hayler 2016b]. In the case of hyperlinks, the digital text acts on the user, inviting her to engage physically by clicking and scrolling, and mentally by encouraging rhizomic or networked, as opposed to linear, readings. Hyperlinks challenge the default grammars of the book-bound context and promote novel forms of engagement that co-shape the ways in which the human reader responds to the text – as Hayler states, hyperlinks are reminders of the possibilities for connection inherent in every written word.

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In discussing the raw materiality of the printed or pixelated page, however, Hayler joins Hayles, Kirschenbaum, and Hayles in assessing how the materiality of each medium can significantly structure the reading experience without requiring a more obvious human interaction such as the following of a link. Hayler shows how media, far from being parasitic on human agency, in fact structure the agency of their users, altering their sense of their potentials. In identifying the histories of the use of pages, with their inherent tendency toward promoting e.g. linearity and fixity, and the newly forged histories of screens, with their tendency towards promoting networked and transient information, Hayler shows how materiality might become bound up with the content of the writing itself in producing meaning, something which feels particularly weighted at a moment of transition between two significant forms. By exploring such entanglements of matter and meaning we can better understand how all texts are co-shaped by a reader, a script, a medium, and a context, each of which possesses its own meaning-making histories. Whilst reading remains a human-led pursuit, there is a posthuman reshuffling of agency here, removing the human from the centre and re-invisioning the reader as a co-constructor of meaning. Hayler ends by suggesting that "digital technology is becoming humanized: made subtle, not jarring, truly deep, not ghostly or shallow, and meaning-rich" [Hayler 2016b, 31]. Humanization is here conceived of as reducing difference (which echoes the reduction of otherness between academics in different fields, or between academics and technicians (or crowds), in the human-human interactions discussed above), the recognition of sameness, not just in the comparison of digital text with print's cultural caché, but also compared to the extent and depth of its material agency and its parity with the human in being an actant in the entanglement that produces the text to be read. That issue, of material devices as legitimate and agential actants, is central to a full understanding of human-material/machine collaboration.

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In "The Object and the Event: Time-Based Digital Simulation and Illusion in the Fine Arts", Stephen Hilyard discusses the creation of simulations through digital tools [Hilyard 2016]. This chapter analyses two distinct forms of collaboration between human and non-human actants – that between an artist and her digital tools, and that between a digital object and its viewer. The former collaboration, however, is couched in terms of subservience (of the tools to the maker), and the latter reveals the digital object to possess agency only in relation to its being viewed, creating a psychological and/or physiological reaction that the viewer cannot escape.

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As traditionally conceived, the artist, as authority and meaning-maker, remains both in control of her tools and her deployment of them in the manipulation of the viewer. The idea of the tool as an object that the user deploys in order to

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achieve a particular end is a conception of intrinsic subsidiarity; in the manufacturing of the artistic simulations that Hilyard describes, hardware and software provide a service. Hilyard explores such manipulations in the context of the realistic simulation of impossible effects, from the "uncanny valley" of images of close-to-but-not-quite real humans to the visually accurate rendering of things that could never exist or act as they do outside of the simulation, things that trick the viewer with a blend of photorealism and the subversion of physics. This sets up a classic fine art paradigm where authority accrues to the artist as maker: the digital tools are just that, and in being seen as subservient to the user, as instrumentalized matter, their own agency is neglected. Similarly, the viewer is seen as being worked upon by the art work rather than entangled with it in the co-production of meaning, an interesting inversion of the hierarchy of human and object as opposed to its flattening – to understand objects as entangled, we argue, is not simply to reverse extant understandings (such that humans become slaves to their artefacts sometimes), but instead to appreciate how agency might always flow back and forth, with humans impacting on technologies and the ways in which they might be deployed, and technologies impacting on their users such that the outcome of use is not determined by either side.

In this vein, throughout the work of the new materialists introduced at the start of this section, we find a much more sustained recognition of the role of tools, artefacts, and objects more broadly in both human affairs and wider networks (where humans might not even be involved in some collusions, as we shall discuss in the next section). The post-phenomenologist Don Ihde, for example, offers a taxonomy of technological interactions: embodiment relationships (where the artefact melts away, such as using a hammer or tennis racquet); hermeneutic relationships (where the tool both enables and modifies perceptions as it is perceived through, such as using a microscope, telescope, or machine readout); alterity relationships (where the machine is an explicit object of concentration apart from the user, such as using an ATM machine); and background relationships (where the device is set and then modifies the background of experience without further interaction, such as the use of a thermostat and household heating).^[14] In Ihde's breakdown of engagements, we start to see the myriad ways in which technologies both explicitly and subtly flavor and condition experience, becoming a part of our perceptions and, in some instances, enabling them to happen at all. Edwin Hutchins' work on "distributed cognition" (e.g. [Hutchins 1996]) similarly demonstrates the extent to which tools might enable the conception of action, as well as facilitating it, and even further displaces the human from the centre of action. His description of navigation on board large naval ships, and the tasks undertaken by combinations of personnel and equipment, combinations that elide neat boundaries between human and non-human actors, sees the network of actants as a distributed system that can legitimately be seen as cognizing; it is the *system* which thinks, and only the system which can have these kinds of thoughts. In the absence of the non-human actors nothing could be done, and certainly not done like this; no one human has control and everyone and everything plays their part toward the goal.

When it comes to DH research, our interest here is in how systems of humans and non-humans co-produce knowledge. What we take from the work of Ihde and Hutchins, and the science studies of Latour, Pickering, Haraway, and Baird, are that tools are never neutral. They, like technicians and crowds, are more rightly thought of as collaborators, whether they are conceived of as such by their users or not. Latour, Pickering, and Hutchins, in particular, are sensitive to the ways in which tools' users, especially in technical and scientific contexts, are typically loathe to see the machines with which they work as anything but neutral. As with human-human collaborations, much is invested in the tools not interfering with the results and in the production of knowledge being ascribed to the individual (and "excellent" researcher), not to anyone/anything she might have depended upon. A profound silence can emerge from hoping to avoid the comment sometimes offered to photographers: "That's such a beautiful picture; you must have a really great camera!"

Non-human agency and the presumed neutrality of digital research tools are explored in Thomas Nygren et al.'s "Connecting with the Past: Opportunities and Challenges in Digital History" [Nygren et al. 2016]. Here the focus is strongly on the limitations of digital renditions of information, couched in the following terms: "assumptions about the unproblematic application of tools to data can be problematic, not least because there is a risk that "data" will be shaped by and for the logic of digital tools" [Nygren et al. 2016, 63]. In this regard, Nygren et al. recognize the ways in which data, as read or received, can be altered by or for the tools used to perform the analysis. The tool introduces its own effects in its parsing of data; in short, as Ihde or Pickering, or Latour also make clear, we make a profound mistake if we see such tools as simply reporting or neutrally working with "the" data^[15]; data are produced for and interpreted by non-human actors as much as for and by human collaborators.

Nygren et al. countered the limitations of their tools, when more adequately recognized, by augmenting the digital with the stories that the flesh and blood researchers could tell, derived from a combination of research methods. By better appreciating what their tools could and could not do, and why and how their specificity might distort seemingly inert or neutral data sets, they were able to see what gaps could be filled in the story with different approaches that didn't rely on digital computation. As they state: "researchers use a mixture of traditional and digital methods to better understand the life and circumstances facing people in the past. Visits to the archives have been combined with visits to the places

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of historical events. In the practice of digital history, this connection to historical settings is still important" [Nygren et al. 2016, 80]. They acknowledge that "materiality may certainly affect our construction of knowledge" [Nygren et al. 2016, 80], but find this much easier to cope with in relation to conventional historical methods (such as visiting actual sites) than in relation to digital constructions or the unfamiliar whose logic is resisted. The collaborators, human or non-human, that are best known can be mostly easily dealt with – recognizing digital tools' effects as, without deep investigation, unknowable might be a significant aspect of successful collaboration with them.

In much of the analysis of human-material/machine collaboration specifically within DH, insofar as it occurs, debates about how we became posthuman [Hayles 1999], or our relative posthumanism as researchers or end users, remain very much alive in the sense that the idea of collaboration with non-human actants tends to be evaded, resisted, or not fully engaged with. Actual making processes are frequently glossed over, the process of the materialization of artifacts, and their agency, is elided, and the liberal subject of the sovereign maker, or viewer, tend to remain firmly in place. But what happens when that subject retreats entirely?

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Material/machine-material/machine collaboration

In purely material interactions between non-human actants we might expect the power hierarchies and politics of human-human and human-material/machine collaborations to be absent as the human retreats from the scene. But for the overwhelming majority of instances in DH research, material/machine-material/machine collaboration

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requires at least prior human-material/machine interaction (and likely prior humanhuman partnerships) – in this way, material-material collaborations rest upon, or are simultaneous with and shaped by, the other types of interaction that we have discussed. Matter, of course, interacts without human involvement all the time, but in digital research it is only in the rare cases where hardware is programmed to roam free, or algorithms are left to produce emergent effects without intervention, that we might consider humans as removed from digital processes, and even then humans are necessarily the originators of the device or algorithm (or of the hypothetical machine which might create or code them). As Julia Flanders states, technical and professional standards in digital research are "an extraordinarily effective mechanism for *representing*...an agreement...between collaborating parties" [Flanders 2012, 79]^[16]. Standardization also enables material/machine-material/machine collaboration, i.e. standards allow systems to read, or "talk" to one another about data or processes, and one question then becomes the extent to which a user or technician ever deals with an open system. Or, put another way, what room there is for the unexpected and unintended, the non-humanly conceived, to emerge?

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Laszlo Hunyadi points out that "human-human interaction seems to be hard to represent in regular form" [Hunyadi 2012, 101] since our understanding of human communication as a pattern is limited – alternatively, it is in their seemingly obvious regularity that interactions which contain non-human elements are presumed to be more easily imagined. Hunyadi's university in Debrecen has created a cognitive robotics lab into which a system of secondary labs without robots is to be networked in order to allow interaction and experimentation between them as a system (www.virca.hu). The project website states: "Imagine a completely new form of relationship with your IT devices: a relationship in which the mouse and the keyboard seem like ancient relics used only by geeks and IT professionals; a relationship in which your "desktop" is much more closely linked with your physical reality, and in which social interactions play a central and practical role."^[17] The derisive conflating of "geeks and IT professionals" aside (another example of the power hierarchies described above), this work is concerned with reducing the boundaries between human and machine, and with creating a cybernetic homosocial triangle [Kosofsky Sedgwick 1985] between human operators and the virtual spaces in which they remotely collaborate on projects, their object of exchange. The video showcases available online, which depict the virtual lab in Debrecen, are all shot from the perspective of the human in his computer room or lab space, looking at the screen. In one video, a robot in the actual room, child-sized relative to the adult male manipulating it, is walking, imitating the adult's steps whilst the robot is also simultaneously projected into the virtual space. The overall impression is of the scientist conducting an experiment, ruling over neutral and inert matter, and controlling virtual space, even if remotely. The primacy of the human remains clearly in view here, both actually and conceptually – what seems like a hi-tech entanglement remains the same story of human dominion.

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Such primacy is hardly inevitable, however, nor does it guarantee the hierarchized relation between human and material/machine. Outside of the DH context, we have already seen quite a few signs of this not being the case, of the unintended consequences of interactions, such as traders bringing down markets in a few misclicks, or the biases that are daily being coded into data sets and search algorithms via normal (though silently discriminatory) use,^[18] etc. To date, machines still need humans, at least for their design and/or the initiation of the processes that they enter into. However, the idea that this produces "control" (by humans) is erroneous – there can be unintended consequences, such as collapsing markets and biased data sets, which themselves generate important questions, much discussed in the

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context of artificial intelligence and science fiction, about the desirable relation between human and digital – are we looking at relations of subordination or of "companion species", of symbiotes, parasites, or some other, as yet unrealised entanglement?

Deepmind's AlphaGo Zero AI is one system provoking significant discussion in this area. AlphaGo^[19] was originally created and trained to beat human grandmasters of the game Go, a territory-claiming game that, unlike chess and checkers, computers have struggled to compete at, even with only moderately above-average players, due to the human "feel" required. There are so many possible permutations of the board that the "brute force" strategies that AIs have tended to draw on in simpler games (trying out as many hypothetical moves as possible before settling upon the best one and playing it in each situation) are simply too time- and computation-hungry to be viable. AlphaGo instead used a combination of human programming, brute force searches, and machine learning – it played a huge number of games against both human and computer opponents in order to train strategies for as many board permutations as possible.

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When the original AlphaGo system did beat Lee Sedol, one of the world's best players, in 2016, *New Scientist* reported on the win's intensifying of an "artificial intelligence phobia" in South Korea [Zastrow 2016]. The presumption of the humanity required to undertake successful Go playing caused a crisis; the computer was assumed to have equalled the leading player in some ineffable category outside of mastery of the game. But AlphaGo was still heavily dependent on human interaction – it was programmed by humans, played against human players in training so as to learn from them, and was explicitly aiming at human-like performance in its first incarnations, having millions of moves from expert players coded into its database of possible solutions as its model of what success should look like.

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AlphaGo, however, has changed. AlphaGo Zero (AGZ) recently beat the original AlphaGo system, and, significantly, had far less human-interaction in its path to becoming the greatest Go player in the world. By again deploying machine learning, AGZ similarly played a vast amount of training games, storing knowledge of the best strategies from each one. But it never played a human opponent, and it was never coded with human strategies or any human's expert moves. It began with completely random play against an iteration of itself – whichever version won, by chance, would go on to play against a new iteration of itself, with the now ever-increasingly competent versions progressing in an evolutionary fashion. The system is now hugely more efficient, and, in the words of its "designers" (probably now the wrong term), "it is no longer constrained by the limits of human knowledge" [Hassabis and Silver 2017]. AlphaGo Zero became more competent than the version of AlphaGo that beat Sedol within three days, and better than the best iteration of the original within 40. The team never found out how good AlphaGo Zero could get; with the wider actants in the system affecting things, as always, they "needed the computers for something else" [Etherington 2017].

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When it comes to the production of knowledge about the game Go, AGZ leaves humans in its wake, and it demonstrates the potential for uncoupling humans from computational systems once they have been set up – humans, like their tools, are not neutral: their biases and limitations can flavour a whole system. AGZ's collaborators in knowledge production, then, straddle the human-machine and machine-machine. It is, and continues to be, its own collaborator, a billion-fold, shaping itself in an entanglement that goes both ways: as each iteration progresses it might lose out to the next incarnation of itself, ceding the ascription of knowledge to the next version that it decides is better. As colleagues and equipment join and leave knowledge-producing systems in more conventional research, so AGZ recruits and rejects itself, over and over. When institutional politics, funding limitations, labour laws, and good graces are replaced by ruthless evolutionary mechanisms, vast progress can be made, and this makes something very clear: we do not want the politics of machine-machine collaborations to transcend their sphere. As the examples of machine-learning algorithms encoding racists and sexist attitudes attest^[20], however, politics does tend to travel – humans may not look like an explicit component in the collaborative system, but their entanglement gets revealed in their shaping effect, as with any other actant. Digital researchers need to function as stewards alive to the effects of all actants, not presume neutrality, as they increasingly pursue machine-machine collaborations which might take on the worst of us or, reversing the flow, to resist the machine's unsentimental excisions of one another becoming a model of best practice.

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Material/machine-machine/material interactions are also becoming more complex as the ways in, and means by which combinations of hardware and software must speak to one another proliferate. While some materials, such as the fore-edge paintings on the compressed pages of books in the private collections of affluent 19th century readers, may still resist being digitized [Trettien 2011], as different kinds of materiality encounter each other, those differences generate new and diverse interactional relations that pit algorithmic logics against noise both from within and from without. In an article on instance-based algorithmic learning, Aha et al. poetically describe their "extended algorithm's performance" as "degrade[ing] gracefully with increasing noise levels and compar[ing] favourably with a noise-tolerant decision tree algorithm" [Aha et al. 1991, 37]. Noise or interference is expressive of difference, and it is such difference that material/machine interactions must increasingly struggle with as we attempt to recruit them in archiving and interpreting

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the world. Such struggles contribute, we argue, to the reasons to be silent around collaborative efforts in DH: difficulty in comprehension and expression are the reasons that many phenomena go unarticulated, but the various silencings of diverse forms of collaboration in DH research also have other sources to which we now turn.

Reasons To Be Silent

Discussions of crowd sourcing, or the example of Gabriel Wolfenstein's depiction of how the gathering of material was facilitated through engagement with enthusiasts in the *Living with the Railroads* project [Wolfenstein 2016], can offer useful advice for DH scholars about how to access certain communities who might be described as potentially "hard-to-reach," and also how to conduct such research, i.e. what new methods and practices might be required. But, as suggested earlier, such concrete engagement with questions of collaboration is not always forthcoming; we want to suggest four core reasons why this might be the case which relate to the key points outlined in the typology of interactions above.

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1. Status and Speed

The first concerns the status and the role of the expert in research. Richard Sennett has produced an important account of *The Craftsman* and the ways in which notions of craft have undergone changes over time [Sennett 2008]. Sennett identifies how, on the one hand, many skills-based activities can now be executed by "unskilled" persons (or, as above, removing people altogether) because technology significantly facilitates or replaces production processes, and, on the other, craft as an expression of honed skill, socialized and shaped by practice and experience *over time*, is bulldozed through by the demand for the ever-increasing acceleration of work processes (we can see this clearly when various forms of "slowness" in production are conceived of as radical as opposed to, say, appropriate). Instantaneity has become the name of the game, from the production of goods to the production of research, and that makes the expert who can provide patient and detailed explanations a seemingly redundant figure (the expert who can be swift and reactive however...). Silence regarding technical ability thus tends to sideline those with specific expertise, particularly where this involves complex skills, reinforcing a power hierarchy that sees academic experts as producers of knowledge and technicians as instrumentalized supporters of this production. This view oversimplifies skills acquisition and maintenance for both academics and technicians, and does not recognise the actual practices of collaboration as they consistently manifest.

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2. The Pace of Change

The second reason why concrete engagement with collaborations may not be forthcoming is also related to the issue of technology as such: as the writer of the email quoted at the outset of this article suggests, "constant technological development", and by implication the obsolescence that accompanies contemporary digital technology, makes discussions of specific technical processes difficult or seemingly undesirable due to fears that these discussions will rapidly become obsolete as the technology changes. Two issues strike us. The first is simple: there is always something to learn from prior practice, and no shift in the technological apparatus of Digital Humanities research is likely to be so great a rupture that all prior work is rendered irrelevant. Secondly, Susan Hockey makes the point that "Humanities source material lasts for a very long time and digital representations of that material need to be equally long-lived" [Hockey 2012, 87]. She discusses the Text Encoding Initiative (TEI) which was set up precisely to ensure this for the digital rendering of script sources. As Hockey notes, "[o]ne of the original aims of the TEI was to create an encoding scheme that would be independent of any particular computing system" [Hockey 2012, 87]. Withdrawal of public funding, however, curtailed this effort and expertise was thus lost. In this way, the speed of technological development can lead to the silencing of discussions of its practices. Tensions exist, for instance, between the development and commodification of technology on the one hand, and its usability across time and space on the other: the enhancement of a technology's functionality typically correlates with its accelerated commodification such that consumers clamour to buy the latest machine and/or app, even if they are unable to fully use the ever-increasing opportunities afforded by their current or new technologies [Gerpott et al. 2013]. Academics may thus become increasingly distanced from the technical experts that they require in order to undertake DH projects as the gaps between known and unknown potential deepen, and at an increasing rate.

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3. The Nature of the Field

A third reason relates to the epistemic dimensions of the Digital Humanities: do they constitute a discipline, or a set of methods or practices, or a sub-set of enquiry? At present there is no ready answer to this question, certainly no orthodoxy regarding DH's domain. Texts such as Kirschenbaum's "What is Digital Humanities and What's It Doing in English Departments?", the annual "day of DH" (which aims to provide a snapshot of the field through the self-report of a day in the life of various academics who identify themselves as Digital Humanities researchers) [Kirschenbaum 2010],

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and an entire reader on the problems of definition [Terras et al. 2014] all engage with the issue of domain in different ways. The continuing need to re-explore the boundaries may also contribute to a dearth of meta-discourses around DH *beyond* its definition, and that includes meta-discourse on the processes of collaboration undertaken during DH projects. Put simply, unless collaborations of all forms become a part of what DH *is*, then the field's focus on definitional concerns will contribute to the current lack of discussion.

4. Neoliberal Imperatives

A fourth reason for the under- and slow exploration of collaboration in DH research concerns the neoliberal imperatives which govern contemporary academe [Strathern 2000] and which continuously flavour the point above. Such imperatives have led to the simultaneous rise of collective work *and* individualized accountability in a context of heightened competition – competition to be "world-class", "excellent", indeed *primum* without *pares*. Where collaborative research is submitted to the REF, for example, the collaborators have to specify what exactly their contribution is. But such specification is largely anathema to proper collaborative efforts and goes against our understanding of creative thinking as a collective and intricately entangled process involving a range of human and non-human interactions. It ultimately denies the "co" of collaboration and, due to its competitive underscoring, reinforces pre-existing inequalities between different kinds of collaborators. As described above, this is partly supported by the hierarchies within academe which construe certain staff as subsidiary and which continue to instrumentalize both tools and people rather than recognising them as co-producers of knowledge.

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Resistance to changing such thinking is fed by a Humanities tradition that locates agency, originality, and meaning-making firmly with the author/maker, a tradition put to work in the justification of copyright extensions which are publicly meant to protect the isolated, "genius" artist and yet predominantly service large corporations' continued control over profitable cultural icons (see [Lessig 2004] [Lessig 2008]). The central texts which rallied the various turns that Humanities disciplines have undergone, including the celebrated (if premature) declaration of the death of the author in favour of the reader [Barthes 1967], the gleeful reassertion of the author's cultural function in the renewed foci on intellectual property, paratexts, and the myth of the persona [Foucault 1969], and the various interpretations of there being nothing outside of the text [Derrida 1976], these texts each tend to reveal a struggle to retain the pre-eminence of the human in the construction of meaning and worth. These same texts also come to underpin a manner of thinking which supports contemporary new materialist and posthumanist stances – the author's death reveals other factors that might play a role in meaning-making; the lack of access to things outside of the text (or context) does not mitigate their role in producing what we can perceive, and how troubled and slippery text must always be demonstrates how we can be fooled in our pursuit of truth; and the vagaries of economic and cultural forces and the inscriptions and material properties of the authored and edited book can show how non-human agency becomes entangled with human activity. Neoliberalism's focus on individual achievement leaves little time for understanding subtle posthuman entanglements with people and things both inside and outside of our full comprehension. In DH research, the non-human actants of hardware and software are, in part, the secret ingredient – not revealed by the master chef so that we might be delighted or surprised by what we are served, but, rather, as in the story of "The Sorcerer's Apprentice", an understanding that we may also find ourselves unable to govern that which we call into being.

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The Effects of Silence

The effects of not speaking about the collaborative processes that inform DH are manifold. For one thing, such silences undermine a certain deliberative approach to education and research which acknowledges the processes that inform that education. This lack of acknowledgment means that processes are constructed as inadvertent and hence beyond our agency. It fosters a "learned helplessness" [Seligman 1972] and leads to situations where academics in their 40s talk of themselves as "dinosaurs" because they do not engage with, are alienated from, and think they cannot understand contemporary technologies.^[21] We see this effect most clearly at every academic gathering that involves technology where, almost unfailingly, something (a PowerPoint presentation, a video clip, the interface between laptop and data projector) does not work, the presenter (usually a researcher or academic) does not know how to make it work, and no technician to facilitate the process can be found. Such disjunctures and competence issues are a norm rather than an exception in academe, and point to divisions (human-human, human-machine, machine-machine) that the silence around collaboration only serves to reinforce and exacerbate. It also has the effect of individualizing this experience, suggesting individualized rather than systemic failures to address and deal with such disjunctures.

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At the same time, contemporary western culture is saturated with online tools that both academics and students use, whether they do DH in a deliberative fashion or not. In her interviews with staff in Sweden working in DH environments, Griffin found that such staff often disavow DH as an academic field precisely because of the ubiquity of digitality. Such ubiquity can lull institutions into a sense of non-responsibility, where the mere existence of Google-based online tools,

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for instance, can suggest that universities or research centres need only participate in this cornucopia rather than consider how this plenitude might require changes to their curricula, delivery, and attitudes towards digitality. But purposive participation, such as we would advocate, and which has to include discussions of collaboration at its core (for instance of distance-collaborations with unknown others who produce tools, farm data created through the use of those tools by scholars, and incite further uses), is critical to becoming and being an effective researcher and scholar, indeed a participant, in contemporary (digital) cultures. We would suggest that the pervasive "fake news" and "fake media" rhetoric of the current moment in part arises from the lack of a critical digital humanities engagement we encounter in education and research scenarios (see <http://blogs.lse.ac.uk/mediapolicyproject/2017/05/22/tackling-fake-news-towards-a-new-approach-to-digital-literacy/>, last accessed 7/10/2017).

Increasingly, digitality is recognized as a collaborative effort and effect, where engagement always involves encounter with collaborators, known and unknown. This means that digital literacy needs, *inter alia*, to analyse digital collaboration that already occurs automatically, and its effects must be addressed. We have hardly begun with this in the Digital Humanities. Failure to address this increases digital divides between those seemingly in the know, those who undervalue the skills and knowledges they actually do have, and others who become more and more technology-resistant as they feel increasingly alienated. In contemporary knowledge economies, as well as in the technologizing environments we inhabit, this is not a sustainable option.

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A further institutional issue here is, as one of Griffin's respondents put it, that institutions have become used to the idea that Humanities 'cost nothing'. This respondent (the director of a DH laboratory that had eye-tracking equipment, scanners, and a whole range of other electronic devices used to conduct various kinds of DH research) had a strong sense that institutions needed to be educated about the fact that the Humanities, and in particular DH, also require capital resources to both establish and maintain themselves. And, whilst there have been related critiques of the needs for certain kinds of DH resources (e.g. [van Zundert 2012]), the basic point that DH requires resources is well taken and becomes more apparent in the context of discussing collaboration since it refuses the rhetoric of the lone scholar, needing only to be equipped with pen and paper, that continues to haunt the Humanities. A related issue here is that institutions need plans for their technology development which includes the re- and up-skilling of staff as well as material resources. Such planning continues to be somewhat haphazard. Rosenblum and Dwyer, for example, note that the fact that as co-directors of a DH Centre they were given 25% and 50% time respectively – clearly not enough to fulfil all their tasks.

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Silence around collaboration contributes to maintaining a stagnant culture in academe, in particular in relation to the fact that collaboration structures learning. Machine-human collaboration occurs in learning all the time in that knowledge producers at all levels constantly mobilize computer-based and –produced knowledge to co-produce their own materials. At the same time the myth of the singular individual who "discovers" continues to be perpetuated in arenas such as prizes (Nobel as well as others), providing a largely false image of how knowledge production occurs. This needs to change if we want to normalize collaboration, the *de facto* reality of knowledge production, for the coming generations of scholars.

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Silence around collaboration also creates issues regarding our perception of the object world, rendering it other and inaccessible. Whilst that world must always be translated into human terms, and something is inevitably lost in such translation, we miss too much in skipping it entirely.^[22] Our tools reinforce, resist, shape, and encode material realities which both pre-exist, and are co-produced by, them, and the better we are able to read these tools' contributions to DH research, the better that we can understand that research's distortions and/or reasons for success.

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If we think of DH as, at least in part, a collection of methods (which certainly not every DH scholar does), then explaining how collaborations might come about and be successful (or not) can be important ways of enabling others to learn from the processes of DH projects. The development of a large body of methodological literature around interviewing, for example, has produced important insights into the dynamics between interviewers and interviewees, leading to a foundational example of the contemporary notion of knowledge as co-produced and situated [Hartsock 1998] [Griffin 2016]. This understanding, in many ways, goes against DH traits such as the standardization of knowledge into readable data, as an effect or requirement of digitization, and the deterritorialization of knowledge that this implies, leaving DH, at times, troubled by the tension between variability and standardization [Flanders 2012], between the unpredictable and the prepared for, the unintended and the deliberate. Unstructured data are near impossible to digest digitally, but this does not mean that digital research can be blind to their effects.

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Not discussing human-human collaborations is also a way of implying a "them" and "us" structure of academe where different categories of contributors occupy different and hierarchized spaces. This results in a reinforcement of the failure to transform the social and political structures of the academy, something that is necessary both in order to better realise the collaborative and interdisciplinary work to which universities aspire and to the realities of such work.

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At the same time, most scholars inadvertently collaborate with technology already, at least minimally through Google searches, online reading, emailing, Skypeconferences etc. Mystifying the collaboration process in DH means constructing resistance to technology by making it into the unknown. This is also reinforced by a lack of recognition in higher education institutions that digital competence is a skill that needs to be acquired and maintained in a manner akin to Sennett's craftsman's training. Such training is often unavailable in academe, not recognized in terms of time and work requirements, and left to the perspicacity and perseverance of individual staff. This results in a DH skills shortage that currently manifests itself in the limited numbers of staff knowing limited numbers of DH tools. In turn, this means that the development of new research ideas and related critiques of DH cannot flourish nor can the collaborations that makes the best DH research so stimulating. It's time we talked more about these things.

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Moving Forward

How, then, could the discussion around collaboration in DH change? As we pursue our own collaborations, that will eventually be written up and published, we're starting to ask how we can best be true to the issues raised in this article. Matt is involved in two projects that have technical, creative, and other non-academic partners and which might function as examples.

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The first, *Ambient Literature*^[23] sees professional writers commissioned to create works of electronic fiction that investigate our relationship with both places and digital technologies.^[24] The project will also result in a co-authored academic book, with no lead author, that includes contributions from, and interviews with the writers and technicians working on the pieces. There will, further, be a "cookbook" aimed at demonstrating, for those interested in the production of these kinds of works, the options and opportunities currently available, i.e. what tools, technicians, budgets, and readers will permit. An edited collection will further gather voices from across writing, publishing, technical production, and academia. Maybe the project is cheating – it was devised to investigate the ways in which collaborations between humans, technologies, and environments manifest and alter in a landscape of ubiquitous mobile computing. But it demonstrates what voices should be included and the balance of power that might be achieved; no one academic gets to be the *primus* deploying everyone else as instruments of knowledge production.

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The second project is an augmented reality performance of *Sir Gawain and the Green Knight*, a medieval text set in the West Midlands. The project is at the earliest stages of development, but as heritage and technical partners are sought (the first to provide an appropriate location for the production, the second to enable the movement of characters, sounds, and settings between real and virtual environments), it is clear that, again, the roles of academic, non-academic, technical, and non-human collaborators will need to be carefully considered. It would now seem impossible to think of the work simply accruing to the two academics on the project team, with all other actants simply being instruments for them to deploy – the *team* will have their say, and when it comes to the silenced roles of the non-humans, be they mobile phones, buildings, or environmental features, there will be at least some attempt to speak up on their behalf.

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Maybe creative productions set the easier precedent; the industrial arts of cinema and videogames, despite the impositions of the auteur, are well recognized as mass collaborative efforts, with cameras, lenses, and sound, graphics, and physics engines all frequently brought to the fore – you could not have seen or played this without all of these people, and all of these *things*. But in any project, we think that it is relatively easy, and undoubtedly important, to resist the silencing outlined above. It boils down to two calls: the first is to recognize that no collaborator can ever be neutral, and the second that, therefore, their roles must be understood as well as possible, before, during, and after the event. Credit and blame need to be attributed, expressed, and shared. That's how we get better.

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Acknowledgments

The authors would like to thank the anonymous reviewers for their extremely helpful comments.

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Notes

[1] See, for example, [Nowvieskie 2012] [Croxall 2012] [Spiro 2011].

[2] We cite this not as a criticism of our contributors, but rather as an example of what is, to us, a surprisingly common stance amongst DH practitioners.

[3] In February 2016, the Arts and Humanities Research Council (AHRC) of the UK, for example, had a call for "Research Grants – Early Careers" which specifically states that "The Research Grants Schemes are intended to support well-defined research projects enabling individual researchers to collaborate with, and bring benefits to, other individuals and organisations through the conduct of research. This scheme is not intended to support individual scholarship." (at <http://www.ahrc.ac.uk/funding/opportunities/current/>, accessed 5/2/2016).

[4] See <http://www.rcuk.ac.uk/innovation/impacts/>, accessed 5/2/2016, for details.

[5] One may, of course, legitimately ask whether or not such engagement constitutes collaboration; the point here is that being a lone scholar is largely no longer an option.

[6] The mooted Knowledge Exchange Framework (KEF) would only intensify this further. See <https://www.gov.uk/government/new/universities-and-science-minister-calls-on-universities-to-do-more-to-commercialise-research-and-innovation>, accessed 30/10/17, for details.

[7] Standpoint theory, for example, concerns itself with the fact that researchers' positionalities impact on the kinds of research they do, how they do it and in consequence the outcomes of that research (see [Harding 1987] [Hartssock 1998]).

[8] Emphasis added.

[9] Emphasis added.

[10] In their *Taboo: Sex, Identity and Erotic Subjectivity in Anthropological Fieldwork* Don Kulick and Margaret Willson (1995) discuss that soliciting contributions on this topic was difficult, and in particular from those who remain the most privileged in most cultures: "The only ones for whom we were repeatedly called on to justify the volume were heterosexual men, many of whom responded with suspicion or even hostility. The only people who actually tried to talk us out of doing the book (usually with the 'think-of-the-damage-this-will-do-to-your careers' hex) were all heterosexual males" [Kulick and Willson 1995, xiii]. In a similar manner, in *Collaborative Research in the Digital Humanities*, it is a woman who names some of the issues that arise in DH collaboration in concrete terms, rather than as an abstract scientific issue. Griffin has related experiences when co-editing a volume on *The Emotional Politics of Research Collaboration*: contributors were reluctant to discuss issues such as blame; several contributors sought reassurances that writing about collaborations would not damage them; some senior colleagues said that they did not want to be written about. Altogether it proved a revealing experience regarding the difficulties academics have with speaking about collaboration.

[11] See <https://www.historypin.org/project/42-railroads/>, last accessed 9/2/2016, for details.

[12] This has continued with [Latour 2005], [Barad 2007], [Bennett 2010], and [Coole and Frost 2010]. There have also been increasingly object-oriented approaches such as [Harman 2002], [Bryant 2011], [Bogost 2012], and [Morton 2013]. For an overview of the field see Rick Dolphijn and Iris van der Tuin's collection *New Materialisms: Interviews and Cartographies* [Dolphijn and van de Tuin 2012].

[13] See e.g. [Ihde 1990].

[14] See [Ihde 1990, 72–112] for more on these relationships. Matt Hayler also proposes a fifth category, reflexivity relationships (where tools cause the user to reflect on their bodies and potentials from an external perspective, such as mirrors and videocameras); see [Hayler 2016c].

[15] For more on this phenomenon across technological use see Davis Baird on the co-production of knowledge with scientific instruments [Baird 2004] and Andy Pickering [Pickering 1995].

[16] Emphasis in original.

[17] Accessed 14 June 2016.

[18] Overviews of issues in this area can be found in [Solon and Levin 2016] and [Foroohar 2016].

[19] See <https://deepmind.com/research/alphago/>, last accessed 8/10/2017, for details.

[20] See e.g. [Devlin 2017].

[21] Griffin has found this in a project she is currently undertaking on women working in DH, where she is interviewing women and men in DH. These interviews are part of a large Nordforsk-funded project on women in technology-driven professions (2017–2022, Project No. 81520). See <http://www.gender.uu.se/nordwitfor> for details of the project.

[22] Matt Hayler has written extensively about the human accessibility of technological objects in his *Challenging the Phenomena of Technology* [Hayler 2016a] inspired by object-oriented philosophers such as Graham Harman [Harman 2002].

[23] See <https://ambientlit.com/>, accessed 8/11/2017 for details.

[24] See <https://ambientlit.com/index.php/2017/04/19/it-must-have-been-dark-by-then/> and <https://ambientlit.com/index.php/2006/07/21/the-cartographers-confessionby-james-atlee/>, accessed 8/11/17, for examples of the first two pieces for the project.

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