


Archives, Information Infrastructure, and Maintenance Work

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Abstract

In the scholarly communications lifecycle, it is the archive (as place and as collection) that has traditionally functioned as *the* research laboratory, the source of knowledge for the humanities and its sub-disciplines. This article examines the notion of the archive as revealed through a process of infrastructural inversion, with an emphasis on understanding the working information practices of archivists as a prerequisite to any discussion of humanities infrastructure initiatives. Situating the archive as a form of infrastructure and archival labor as a form of maintenance work generates descriptions of archival systems and practices that shine a spotlight on key negotiations and tensions that adhere in a profession that exists in service of others. In particular, the article and the argument therein set out to describe what will be lost if this archival assemblage of people, practices, activities, artifacts, and structures is set aside rather than ported into any imagining or re-imagining of the humanities of the future.

Introduction^[1]

To be modern is to live within and by means of infrastructures [Edwards 2003, 186]

The task for scholars of infrastructure, then, is not merely to dwell on the materiality of infrastructure — an important topic on its own right, to be sure — but to dig deeper and uncover the humans who keep things going. [Fidler and Russell 2018, 905]

Built over centuries, the scholarly infrastructure that forms the backbone of the humanities includes “diverse collections of primary sources in libraries, archives, and museums; the bibliographies, searching aids, citation systems, and concordances that make that information retrievable; the standards that are embodied in cataloging and classification systems; the journals and university presses that distribute the information; and the editors, librarians, archivists, and curators who link the operation of this structure to the scholars who use it” [Unsworth et al. 2006, 6]. Since its modern inception, the infrastructure of the archive has enabled key functions required of humanities scholarship: authentication, providing researchers with an assurance of the trustworthiness of records as records; awareness, enabling a community of scholars to discover and understand needed sources; gathering, allowing scholars to build personal collections of primary source materials; contextualization, facilitating scholars in situating sources in the circumstances of creation and use; tracking, creating a means to credit the information used through the process of proper citation; and preservation, ensuring the reliable and long-term maintenance of the historical record for future generations of scholars [Trace and

In the past twenty years the virtue inherent in the long-standing nature and widespread use of research infrastructures has been upended in a world in which the digital has come to the fore and the infrastructural push in the humanities is oriented to the large-scale, the new, the innovative, the future-oriented and the technologized. Initiatives such as the European Holocaust Research Infrastructure [Anderson and Blanke 2015] and the Cultural Heritage Data Reuse Charter [Baillot et al. 2017] situate archives as institutional players in the ongoing development and transformation of the humanities. Yet in analyzing the rhetoric of *Our Cultural Commonwealth*, a 2006 report published under the auspices of the American Council of Learned Societies to guide humanities infrastructure development in the United States, Speck and Links highlight the limited role ascribed to the archivist centered on the collection, management, and preservation of the cultural record [Speck and Links 2013]. As Speck and Links [Speck and Links 2013] note, in the push to attune humanities infrastructural development with cyberinfrastructure developments in the sciences, existing relationships between scholars, archivists, and archives have generally been overlooked. Indeed, research by Poole and Garwood suggests that some scholars working on large scale data-intensive digital humanity projects are unaware or unconvinced that archivists have requisite skills on which they could draw [Poole and Garwood 2018]. Part of the explanation for this may lie in arguments made by scholars such as Svensson who, while acknowledging the need to engage with existing infrastructural traditions, caution against extending or building “uncritically” on this base [Svensson 2016, 143].

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Such viewpoints seek to upend existing “epistemic commitments” in the humanities, whether pertaining to structure, material types, selection procedures, access and retrieval systems, or the relationship between researchers and entities such as archives [Svensson 2016, 145]. Disrupting the institutions, systems, and professions at the heart of collection management is one way of seeking greater legitimacy for the humanities; rejecting the image of the humanities as a discipline bound to pen and paper and instead focusing on developing novel infrastructural platforms, material assemblages, intellectual agendas, modes of material engagement, and interpretive frameworks [Svensson 2016]. Even in instances where there is a recognized lineage between the traditional and the emerging, the reimaged humanities are expansive at a scale that threatens to stretch the fabric of the already overtaxed infrastructure on which it is built [Trace 2021]. Such an unrestrained vision for the humanities in the digital age includes the “complete digitisation and virtual unification of the cultural record,” along with “universal access” to it [Speck and Links 2013, 131].

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Missing or buried in much of the recent discussion of the future of humanities infrastructure is the idea that lessons can be learned from studying extant systems; to reflect on the ways in which they have existed in use and the ways in which they have been stewarded - sustained, maintained, repaired, and remodeled - over time. Also largely missing from this discourse is the understanding that claims that the archival infrastructure is visible, knowable, and available to the humanities scholar is complicated by the act of mediation. In the digital humanities literature Speck and Links [Speck and Links 2013] note the diminished sense of understanding of the role the archivist plays as intermediary and as mediator in the research process, with Rosenzweig [Rosenzweig 2007] providing a historical grounding for the associated decoupling of the historical and archival professions. As Speck and Links discuss, inter-mediation is undertheorized in the literature on research infrastructures despite an acknowledgement that humanities research infrastructure exists within a “complex relationship between scholar, archivist and archive” [Speck and Links 2013, 128]. From an archival perspective, what is lost or at best ignored in this discourse is the central and evolving role that archival information labor has played for the past one hundred years in allowing humanities infrastructure to function. In the focus on the digital we see a neglect of notions of physical space and the associated skills and knowledge that grew up around and alongside the physical archive.

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As Downey asserts, information labor “always takes place in, and depends on, a particular spatial/temporal and political-economic context” [Downey 2014, 148]. Despite or perhaps because of its invisibility to the outside world, the nature and composition of the labor that undergirds maintenance work has recently been the focus of intense scrutiny among archival practitioners. Echoing Jackson, the archival profession has come to understand that “questions of visibility and invisibility may be intimately linked to power” [Jackson 2014, 229]. That its labor is often contingent, done by workers on temporary contracts brought in to try and diminish an ever-present backlog, highlights one set of concerns about the ethics and sustainability of the maintenance process [Trace 2021]. That, typical of other feminized professions, the

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emotional labor inherent in such work goes unrecognized, has been an additional source of tension.

Edwards states that “to understand an infrastructure, you have to invert it” [Edwards 2010, 20]. This article is a call to action to resituate the archive as a critical form of infrastructure embedded within and existing beneath the surface of academic life. The goal is to enact the archive as a form of information, knowledge, and research infrastructure; an infrastructure that science and technology scholars show is sociotechnical in nature [Henke and Sims 2020]. The article centers and scrutinizes the labor of the archivist as a form of infrastructural maintenance work for the humanities; a maintenance that is of the network, of the buildings, and of the collections under care. Situating the archive as a form of infrastructure and archival labor as a form of maintenance work generates descriptions of archival systems and practices that shine a spotlight on key negotiations and tensions that adhere in a profession that exists in service of an infrastructure built for others. In particular, the article and the argument therein serve as a reminder of what will be lost if the traditional infrastructure and the maintenance work of the archive is set aside rather than ported into any imagining or re-imagining of the humanities of the future.

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Star outlines several ways that information infrastructures can be read: as material artifacts of human construction with a focus on the attendant physical and pragmatic effects; as records or traces of human activities whose artifacts can be examined as a way of unearthing associated cultural values, conflicts, points of decision making etc.; and as unproblematic, genuine, and complete representations of aspects of the world [Star 1999]. In the context of this article, the emphasis is on reading archival infrastructure as a long-lived artifact, looking at the organizational complexity and the layers of control and access it supports and that affect the ways in which humanities work gets done.

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The Development of the Archive as an Information Infrastructure and Mediator for Knowledge Discovery

Infrastructures are man-made facilities and resources – roads, railroads, municipal water supplies, sewers, communication networks – which produce goods and services on which the modern world relies [Edwards 2003]. Such infrastructures are said to be the “connective tissues and the circulatory systems” that create and co-create modernity [Edwards 2003, 185]. Metaphors present infrastructure as a ‘substrate,’ a material entity that is built and maintained in service of, and as a base for, the running or operation of public and private systems [Star and Ruhleder 1996]. The notion of infrastructure as an inert entity is complicated by the recognition that infrastructures are more than simply material things. As Edwards notes, infrastructures function not just as “environment” but also as “social setting” [Edwards 2003, 186].

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Indeed, infrastructures are understood as fundamentally relational in nature, instantiated, and given substance when a continuous and potent mix and flow of people, practice, activities, artifacts, and structures come together [Star and Ruhleder 1996] [Edwards 2003]. As a form of socio-technical assemblage or ecology, infrastructures exist within specific landscapes, having grown from an installed base, being embedded in other social structures and arrangements, and having a certain spatial and/or temporal reach. The number and complexity of socio-technical ties, coupled with the fact that it develops cumulatively over time, means that “once set in place or in motion, infrastructures take on distinctive inertial qualities” [Jackson et al. 2007]. Infrastructure is also knowable in various ways - transparent and available for use, shaped by the conventions of communities of practice, and learned as part of membership in distinct groups. Yet it is often taken for granted, most visible when it is in breakdown mode and in need of repair [Star and Ruhleder 1996] [Star 1999] [Edwards 2010] [Tanweer et al. 2016].

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Infrastructures for research and scholarship have been around since late antiquity when the Alexandrian Mouseion housed a cultural center, university, and library. Over the centuries, developments such as the advent of scholarly disciplines, advances in the creation of taxonomies and classifications, and the diffusion of scholarly journals helped to create the bedrock infrastructure for humanities scholarship [European Science Foundation 2011]. This past century has seen a boom in the development of a network of infrastructures that exist to support and sustain knowledge discovery. As Paul Edwards describes, these infrastructures exist as “robust networks of people, artifacts, and institutions that generate, share, and maintain specific knowledge about the human and natural worlds” [Edwards 2010, 17]. This growth of knowledge and information infrastructures coincided with a period of change for higher education in the United

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States, one in which the model of a research university with distinct academic disciplines, and with original knowledge production at its heart, was ascendant. Looking at the more recent history of knowledge infrastructures highlights how different fields have responded to and organized around the recent call to be 'data intensive' [Shankar et al. 2016]. The rise of data archives in the twentieth century, as an exemplar, was linked to the quantification of social science disciplines, with the associated shift toward methods and data afforded more prestige in the academy [Shankar et al. 2016]. In the United States, data archives emerged on university campuses from the 1940s onwards, providing preservation and access services for social science researchers looking to conduct longitudinal, comparative, and cross-sector research with quantitative statistical data sets, at scale [Eschenfelder and Shankar 2017]. As an information infrastructure, data science archives are constituted by and rely on the work of agents (data processors and data curators), who reformat and clean survey data in an act of remediation as the data moves from the collection and analysis phase to one of subsequent reuse [Plantin 2019].

Archival repositories of historical knowledge form part of the essential organizing practices and information infrastructure for research dating back at least to the time of the French Revolution. As a form of research infrastructure, archives are 'transversal' in nature [European Science Foundation 2011]; serving numerous disciplines but seen as particularly relevant and scoped for the humanities. In the scholarly communications lifecycle, the archive (as place and as collection) is *the* research laboratory, the source of knowledge that underlies and supports the humanities and its sub-disciplines [Trace and Karadkar 2017].^[2] In constituting an infrastructure for the humanities, the archive is viewed as substrate, situated in a support role for the research agenda of others. This manifestation follows earlier instantiations of the role of the archive through history – the paradigm of the palace archives of late antiquity and the early Middle Ages, the archive as the treasure chest of legally valuable records of the medieval period, and the archive as a tool for political administration and keeper of government (state) authority as manifested in the state chanceries and record-keeping systems of the early modern period [Bautier 1968]. The notion of the American archive today embodies and encodes that part of the American psyche that seeks to connect with history and culture, to strengthen community and a sense of belonging, and to protect people's rights and entitlements.

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The infrastructure of the archive can be understood in terms of its various modes of existence - intellectual, physical, and informational. In pursuit of professional legitimacy, the intellectual infrastructure of the archive has been developed as part of a push for autonomy from the discipline of history; a concern to have a distinct knowledge base of archival theory and practice. The goal of professionalism is manifested in archivists' concern for standardization and the creation of consistency in norms, rules, values, work process, and product. As a physical infrastructure, the archival edifice and its work, storage, and research spaces are cocooned within building and environmental standards for materials security and management, disaster preparedness, and facilities expansion and renovation [Pacifico and Wilsted 2009]. Its digital infrastructure enveloped within audit and certification standards for ensuring the trustworthiness of the repository in terms of its organizational structure, digital object management, and security risk management. As an intellectual base for research today, archives are the centralized and distributed conduits to analog and digital documentary by-products of past human activity – personal, organizational, and governmental. While the data archive is the primary home for surveys, enumerations, public opinion polls, and the like, the archive is the storehouse of information and evidence about social life and social institutions that elements of society deem valuable to preserve. Operated by archivists, the archive is the place to go to "gather firsthand facts, data, and evidence" from analog and digital primary sources that run the gamut from letters, reports, notes, memos, and photographs to email, database files and twitter feeds.^[3]

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As a form of knowledge infrastructure, archives in the United States were funded initially through private enterprise vis-à-vis membership supporting historical societies. The largesse of public monies was later infused in state, federal, and city run archives through means of government appropriations, with the higher education sector supporting archives with public money funded through state taxes. In the process, archives were entangled with powerful political, economic, and social forces with constraining and enabling effects on their utility and function. The chief technical function of the archive is to move recorded information across time and over distance for current and future generations. Grounded in time and place, materials are held and made accessible within the archive so that people can come to an understanding of the past. In the process, as Tom Nesmith says, "users of archives invariably want to look straight through archival institutions, their work, and their records, at something else in the past of greater importance and

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interest to them” [Nesmith 2002, 27]. Yet overlooking the archive obscures the fact that access to the past and its traces is both limited and incomplete; populated from and embedded within societal frames that serve to control, amplify, and reproduce elements and ideologies of society.

In the United States historians were the initial system builders. Transferring and adapting European practices they advocated for the construction of the infrastructure of the archive, culminating in its modern form in the early twentieth century. In the nineteenth century, historical research was constituted around a set of inculcated collective practices; a distinct scientific method that sought to cement and legitimize the work and its place within the academy. In this imagining, the historian sought to usher in the notion of the archive as *the* source for data for a new scientific approach to history; mastering the archive by amassing facts and evidence from whence he (and it usually was a ‘he’) “impartially and rationally constructed a scientific account of past reality” [Smith 1995, 1167]. Yet by the 1930s the still nascent American historical profession had sloughed off its responsibility for managing the archive, with the occupation of the archivist emerging as the labor to configure the techniques and technologies necessary to support, develop, and sustain this information work [Trace 2017].



Figure 1. Photograph of the U.S. National Archives building being constructed, 5/1/1934. National Archives ARC Identifier 7368457.

Throughout, history demonstrates that archival work is service work; work in maintaining the information infrastructure for others, whether it be for bureaucracies, administrations, or researchers and their orderly pursuit of knowledge. In this latter scenario, the archivists serve as the defacto ‘information intermediary,’ helping researchers as they “approach, consider, and make sense of information” [Ehrlich and Cash 1999, 148]. Yet, as noted previously, the work that the archivist performs on the historical record moves the profession beyond intermediary to that of mediator. As Latour notes, mediators are transformative – working to “transform, translate, distort, and modify the meaning or the elements they are supposed to carry” [Latour 2005, 38–39]. Analogies and metaphors in the archival literature are rife with references to these distinctive understandings of archival infrastructure and archival work. These understandings align with Star’s concept of the “master narrative,” an encoding or work which involves the reduction of the infrastructural actor to the “unconscious center, the pseudo-inclusive generic” [Star 2002, 119].

The Alignment of the Archive to Maintenance Work

Maintenance is a war – maybe *the* war – with entropy [Russell and Vinsel 2018, 8]

In the discourse of the digital humanities, an appreciation of the agentic role and orientation of the archive does not always resonate or align with the expectations and carefully crafted identities of stakeholders external to the archival profession. In the digital age, prevailing forces revolve around the need for humanities scholarship to be innovative, boundless, and future oriented. The archive with its perceived adamancy, physicality, and rootedness complicates that image leaving stakeholders to adjust archival representations to suit. One option in situating the role of the archive and the archivist in this new endeavor is to recast the archivist in a decidedly backstage role and one directed by the wisdom and experience of those served. As Drucker describes, information professionals do well to remember that their role in infrastructural development is that of builder or architect, always working at the behest of the client - the humanities scholar. For Drucker, the way that the humanities scholar understands knowledge and their “tasks as scholars” should be the primary drivers as scholarly environments are designed [Drucker 2009].

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Regardless of what role humanities scholars ascribe to it, the archival profession has always had a strong sense of its own autonomy; an autonomy that is constructed and reconstructed as it comes into contact and under the influence of various disciplines – history, library and information science, and more recently, computer science. Yet the archival profession has waxed and waned in its understanding of the power inherent in its structures and in its labor, and the degree to which it is comfortable revealing or hiding this capacity from others. Early metaphors of labor, servitude, and care abound as applied to the profession of the archivist. Given that writing was first developed in the process of “keeping account of the land and its produce” [Yale 2015, 332] it seems fitting that a predominant image is that of agrarian toil in service of others with the archivist preparing the way for the scholarly process to come.

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In the late nineteenth century, Canadian archivist, Douglas Brymner equated the archivist to a settler working to clear the land in readiness for cultivation by the historian: the archivist “must not forget that he is only the pioneer whose duty is to clear away obstructions; the cultivated fields will follow” [Public Archives of Canada 1890, x]. Later, Hugh Taylor characterized archival work as more in tune with well-rounded husbandry; with records and the information they contained needing to be cultivated and tended by archivists “if there is to be a fertile crop of knowledge and wisdom forthcoming” [Taylor 1984, 36]. Pioneering English archivist Hilary Jenkinson compared the archivist to a beast of burden; an ox in servitude of man, entitled occasionally to partake in the spoils of his own manual labor [Jenkinson 1980].^[4] Distinct from the agricultural frame, the analogy of the archivist to that of a paleontologist surfaced in the Dutch manual of Muller, Feith, and Fruin; an early attempt to wrap archival labor in a mantle of professionalism and scientific legitimacy [Ilerbaig 2016]. This mantle reemerged in the digital age with the idea of the archivist as digital archaeologist, unearthing, excavating, and preserving important digital objects inscribed on obsolete storage media [Galloway 2011].

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Perhaps the most enduring modern archival metaphor is that of the archivist as physical and intellectual custodian or guardian, whether it be of the material under care or of a creator’s or donor’s legacy [Wexler and Long 2009]. Indeed, Terry Cook has equated the archival profession to that of “an invisible caretaker, a docile handmaiden” [Cook 2010, 3]. Yet, from a postmodern perspective, the archivist, and their workplace, are understood as more consequential than such a supporting role implies. Brien Brothman’s [Brothman 1991] notion of the archivist as custodian or groundskeeper is one in which the archival ‘ordering’ and ‘tidying up’ of physical and intellectual spaces is creative and consequential. Mediative so to speak. Indeed, the archival designation and removal of information that is deemed ‘dirt,’ ‘rubbish,’ ‘weeds,’ or ‘debris’ is seen as a form of axiological othering; what Brothman deems “socially determined exclusion” [Brothman 1991, 81]. Thus, the archival essence is to theorize about and to engage in acts of qualification and disqualification. The resultant selective knowledge transfer is accompanied by the equally far-reaching effect of archival ordering and representation via the processes of arrangement and description; acknowledging that the archivist is not only selectively moving information through time and space but co-creating and situating it in the process [Trace and

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Dillon 2012]. The idea of the archivist as ‘someone who protects’ has also been lately realigned; this time with carceral and other metaphors of imprisonment. This reimagined metaphor confesses the archival role in controlling and consigning the record and in surveilling, monitoring, and policing the researcher who enters onto the archival premises [Ketelaar 2002] [Jimerson 2006]. It is an acknowledgment that the archive, like other infrastructural forms, can “bend human routines and material practices to its will” [Howe et al. 2016, 5].

Drawing from the work of feminist theorist Judith Butler, recent archival scholarships also home in on the metaphor of performativity. In such a scenario archival work is described as ritualized labor within a performative space with archivists acting as “performers in the drama of memory-making” [Cook and Schwartz 2002, 172]. Linking archival work to that of performativity is an acknowledgement and a call to consciousness that standard archival procedures exist as inherited scripts; ones the profession is capable of embodying but also rewriting or otherwise setting aside. Here Terry Cook and Joan Schwartz foreground the archivist as “an actor, not a guardian; a performer, not a custodian” [Cook and Schwartz 2002, 183]. In doing so the work of the archivist is deliberately moved from a backstage to a front stage perspective. A similar metaphor is introduced by Gabrielle Dean [Dean 2011] who rejects the notion that the “archival encounter” is solely that between researcher and source. Instead, she heralds the archivist as part of a “cast of characters,” conjuring these relationships within the archive as “more a barn dance than a pas de deux.”

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In the newest twist on agentive understanding, the most militant archival metaphor is ecological in origin, serving as a “potential corrective” to the various anthropocentric takes on archiving that have been discussed to date. Reorienting the archival perspective, Dani Stuchel [Stuchel 2020] leads from the premise that “not all agents or entities responsible for material changes in the archive are human,” and thus the archive should be understood as more than a “human institution about human history.” Directing the archival profession to theories from the fields of new materialism and critical plant studies Stuchel reveals the often hidden but vibrant life force and material reality of things in the archive; formed in a complex web of people, societies, cultures, technologies, and the natural world with aims that can be independent of our own [Stuchel 2020]. This is a worldview in which archives are understood as “agential material assemblages characterized as much by the actions of dust, moisture, and plant matter as they are by human records and labor” [Stuchel 2020].

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Returning to the central notion of this article - that of aligning the role of the archivist to infrastructure and the installation and repair of systems - we can see that this idea was first explored by Canadian archivist Hugh Taylor in the 1980s in his use of the metaphor of the archivist as plumber [Taylor 1987]. Taylor compares the inner workings of the archive to a network of pipes; conduits through which information flows along distinct channels, with descriptive finding aids acting like taps to deliver information to the user. In this metaphor, archivists’ bedrock concern is maintenance: “that our storage tanks do not leak, our taps work, and the information comes out in a nice steady stream” [Taylor 1987, 25]. Playing into the image that later evoked concern from digital humanists, Taylor characterizes such long-established archival information systems as staid, inward looking, and rather monopolistic in outlook. Yet, tying the archivist to an image such as the plumber is critical to rendering the archive as a material entity (human and non-human); showing it to exist as a socio-technical (as well as ecological) space through which information flows from creating entities through the archivist to the humanities scholar, while surfacing the ‘on the job’ labor that makes the process possible.

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Whatever the ascribed metaphor, the notion that archivists merely work (whether efficiently or not) at the behest of the client plays into the notion of humanities scholarship as an individualistic and self-contained endeavor. It is a viewpoint that undermines or at best downplays the cooperative if sometimes fluctuating efforts involved in the practice of humanities scholarship, including the many dependencies and interdependencies between the creator, the scholar, and the archivist. It seems expedient to reiterate here that the work that goes into imagining an infrastructure into being should be accompanied by the work that goes into maintaining it long term and ensuring its future. Indeed, the combination of infrastructure and the scope of human and of historical time should invariably and inevitably lead to questions of upkeep. Upkeep is a state of being, an act, a process, a form of care taking or aftercare, and sometimes a means to an end. In the research literature ‘upkeep’ is synonymous with the concept of ‘maintenance.’ In academic disciplines and professional practice, maintenance is a lens (“a theoretical framework, an ethos, a methodology, and a political cause”) that grounds our experience of a world in which the breakdown and repair of infrastructures (political, civic, physical, social, natural etc.) are commonplace [Mattern 2018].

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As Edgerton notes, maintenance lives in a “twilight world, hardly visible in the formal accounts societies make of themselves” [Edgerton 2011, 79]. In a blog post on the Maintainers website, the authors [Russell et al. 2019] ruminate on the reasons why maintenance and maintenance work are neglected at all levels of society; factors with a clear resonance with the discourse around the future of the humanities. According to Russell et al. [Russell et al. 2019], the psychological disposition of people today shows a preference for novel things in the environment, with such a cognitive bias coexisting with a desire for proximate rather than distant outcomes. Moving from the individual to the societal and cultural level they see an attunement to and mythologizing of innovation and short-term growth to the detriment of caring for the established and the operationalized. The authors note that economic incentives factor into whether organizations approach maintenance in a proactive or a reactive and repair-focused manner, with notions of profitability and performance often formative conditions. Here the idea of status, interest, and power are also prevailing forces, impacting which public and private infrastructures are deemed worthy of maintenance, with the identity markers of maintainers, including that of gender, positioning this occupational role low in the established social hierarchy. From the perspective of the maintainers themselves, temporal and social pressures mean that a delicate balance or set of tradeoffs are always in play when it comes to fixing things under their care. Fixes can be patchwork, hasty, and short lived or systemic, methodical, and long-term. In the first case the bet is on making something better quickly while setting aside the issue that it will continue to get worse in the long-term. In the second scenario the fundamentals of the situation are addressed over time, even as the situation may deteriorate in the short and medium term.

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These reasons for the neglect of maintenance and maintenance work resonate in the archival profession today. Indeed, the difficulties of maintenance have long been seared into the archival imaginary [Trace 2011]. Arguably, the story of the archive in the United States has been one of ongoing conditions and acts of maintenance and of repair conditioned by the framework of fragility. The changing nature of institutions, technologies, social arrangements, and stakeholders means that all infrastructures are fragile over time [Borgman et al. 2016]. Yet the archival notion of fragility is particularly tied to conditions that drive toward notions of failure and degradation, including the impossibilities of maintaining a material and intellectual infrastructure that the archival profession has closely tied to a bedrock principle of permanence. Time here is the constant that leads to breakdown. It is the recognition that the archival infrastructure is not and cannot be an adamantine structure. In such an open-ended scenario, durability is only possible when there is immediate and ongoing “care and maintenance of individual components and the links between them” [Borgman et al. 2016, 1].

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In a distinct yet related sense, the notion of infrastructural fragility is also bound to the societal level and to the constant uncertainty whether the financial resources necessary to sustain the archive will be forthcoming [Borgman et al. 2016] [Trace 2021]. Indeed, the archival infrastructure has long been subjected to political buffeting as society struggles to understand and accept the archive as “an administrative, economic, or social good” [Trace 2017, 134]. The ongoing battle for resources and the conditions of scarcity that result, are tied to the lack of social resonance to that which the archive clings - to the past, to history and the humanities, to the study of human culture. The feminized nature of the profession serves as an additional point of perceived fragility, providing little of the needed social and political cover or cachet to enhance the status of archival labor. The lived experience of scarcity is thus defined by and embedded within women’s maintenance work.

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A vignette from the story of the emergence of the archival infrastructure in the United States demonstrates the fragility inherent in organizations with low social visibility as embedded in different societal layers. The case of the official repository of archival records for the U.S. state of Georgia serves as an exemplar here, highlighting the cyclical political and social forces of administrative and bureaucratic reform that continually undermine the survival of this and other state archival agencies over more than a century of existence [Trace 2015] [Trace 2017]. On the first day of January in 1919 the Georgia Department of Archives and History began its life in the state capitol building in downtown Atlanta operated by a staff of three - the first state archivist, Lucian Lamar Knight; a stenographer; and an African American porter, Charlie Justice. Speaking to the hearts and minds that glorified a history of the elites and of white southern exceptionalism, the archive yet struggled to endure in a state system in which value adhered overwhelmingly to those contributing to the narrative of capital rather than historical accumulation. Two years after operations commenced, Governor Thomas W. Hardwick (1921-1923) singled out the Department for closure under the aegis of a state retrenchment plan. With a focus on pruning state agencies of an educational, humanitarian, and charitable nature

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(categories which Hardwick believed fell outside of the purview of legitimate state business), Hardwick set in motion a plan of economy and efficiency that echo in the halls of state government a century later [Trace 2017].

While supporters of its historical mission rallied to defeat the first onslaught on the infrastructure of the Georgia state archive, its second and third decades are a textbook case of how macro and meso level economic prerogatives for maintenance abide with localized micro-level ones. Indeed, the story of the second state archivist of Georgia, Ruth Blair (1925-1937) highlights how the struggle to maintain infrastructure is often part of the gendered division of labor. As Denis and Pontille note, “maintenance work participates in a care of things” [Denis and Pontille 2015, 341]. Blair’s story is one of infrastructural care work; work in which she gave her practical labor to ‘patch up,’ ‘set right’ and ‘keep going’ an infrastructure still in its infancy. This commitment to holding together the archive was put into practice when Blair secured the removal of the Archives Department from the cramped conditions at the State Capitol to Rhodes Hall, a Romanesque revival style twenty-two room mansion on Peachtree Street in Atlanta, formally known as ‘Le Rêve.’ While the legislature appropriated \$5,000 to repair the building and install shelving, the economic conditions of depression-era Georgia provided cover for a situation in which the specificities of care could be neglected. Thus, no state money was appropriated for the ongoing maintenance of the building, an expenditure estimated at \$1,500 annually (the cost split between employing a porter and paying for heat, light, water, and incidentals). With the state abrogating its duty as maintainer, Blair took on the responsibility to pay for the upkeep of the building, an undertaking that cost no less than \$1,800 before the situation was resolved [Trace 2015].

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In a classic case of the fact that, as Berlant says, “resilience and repair don’t necessarily neutralize the problem that generated the need for them” [Berlant 2016, 393], the Georgia Archives continues under a perpetual shadow of scarcity a century after its founding. In the latest incarnation in 2012, Georgia Governor John Nathan Deal and Georgia secretary of state Brian Kemp waged their own campaign to shutter this administrative unit of state government. This even though expenditures on state archives and records programs were later established as below one-tenth of 1 percent of total state expenditures [Council of State Archivists 2015]. In this instance the fragility of the archive was once again bound to rhetoric in the United States that champions government frugality and retrenchment, aimed solely at a program and services deemed superfluous to the core functions of government [Trace 2017]. And once again it was only in the mobilization and deployment of concerted countermining weights - in this instance the longevity of the archives installed base and the ability to marshal historical, heritage, and genealogical organizations to its cause – that crisis was diverted.

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The Archive and the Labor of Information Maintenance and Repair

The upshot is that millions of people go to work each day to do things that almost no one but themselves understands but which large numbers of people believe they know enough to set policy, offer advice, or redesign. Work has become invisible. [Barley 1996, xi]

Still, it is not just the physical or hard infrastructure of the archive that must be maintained for the research process to function. Like Barley and Bechky’s study of technicians in scientific labs, archivists, as technicians for the humanities, “manage the interface between a larger work process and the materials on which the process depends” [Barley and Bechky 1994, 88]. In the language of goods and services, the archive exists as an infrastructure of information production, distribution, and consumption. Embedded in the notion of the archive is the idea of a steady flow of information that resides within and moves through socio-technical systems - from the creator to the archivist to the researcher. Maintaining this information flow subtends and is given expression in the archive through the backstage and normalized act of archival processing. Archival processing is connective and coordinative work; the ‘articulation work’ [Strauss 1985], so to speak, that the archivist does as a middle actor to link and mediate between past, present, and future.

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The phrase ‘archival processing’ is a stand in for the work that allows the archivist to gain intellectual and physical control of archival materials through the activities of accessioning, arrangement, description, and preservation. This work includes arranging or rearranging archival materials into recognized groupings (the evidentiary layers of record group, subgroups, series, and files), while also stabilizing and inscribing context in a descriptive finding aid for the

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collection ready for the user to discover. The rhetorical strategy of the finding aid works to hide the agency and emotion of the archivist from the process and from the associated narrative presented to the reader [Trace and Dillon 2012]. In this way, archival processing demonstrates how the act of mediation can be embodied but at the same time rendered invisible through tools [Ehrlich and Cash 1999].

Archival processing exists within a system that is broadly characterized by its modularity; modularity being an 'ordering concept' used by information disciplines and professions as a strategy to manage information under their control [Russell 2012]. In the archival system, processing of materials takes on the characteristics of a core module, being standardized across collections and interchangeable among them. Processing also demonstrates modularity in its ability to coordinate and manage complexity; to "black-box" the messy internal details of the system and thus bring "efficiency and order" to a complex socio-technical system" [Russell 2012, 258, 260]. Processing is also a sign that data does not automatically flow along the archival pipeline; it requires what Leonelli describes as careful and standardized "packaging" to be transported from the context of production across the research infrastructure with the ability to serve as potential evidence at the end of its journey [Leonelli 2016].

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Figure 2. Photograph of archivist Sara Jackson at her desk in a stack area of the National Archives Building, 1935, National Archives ARC Identifier 122213584.

The conditions for processing are closely tied to notions of evidence. According to Downey, information labor exists to make information useful, in the process working to set information in motion so it can circulate from one context to another [Downey 2014]. In the archive, the collection level maintenance work of the archivist exists in what Barley and Bechky [Barley and Bechky 1994] call an act of 'brokerage' - a four-way relationship of creator, archivist (as technician), user, and the record. Mediation is necessary because the traditional impulses of historical methodology, buried within colonialist and capitalist frames, are inherently extractive. For archivists, analog and digital records exist as technical artifacts to be curated when removed from their creating context. Archivists respond to the act of extraction by engaging in ongoing restorative labor – backstage work to recreate the context of creation for subsequent users of the archive [Trace 2020a] [Trace 2020b]. If the goal of social science data curators is that the artifacts be pristine to be reused [Plantin 2019], the goal of the processing archivist is to resettle the artifacts as evidence in place, but to do so within the confines and limitations of the archive [Trace and Francisco-Revilla 2015].

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An elemental concern for setting information in context means that archivists strive to maintain the link between the records, their creators, the functions and activities that brought the records into being, and the recordkeeping structures in which they were originally stored. This maintenance work is methodologized through guiding principles and conventions of practice; these are the base layers of infrastructure as noted by Bowker and Star [Bowker and Star 2000]. In the analog realm these conventions of practice center on cognitive and physical skills which archivists deploy to review, analyze, sort, organize, and present information in context. In the digital realm of small and big data collections, these same skills are utilized in tandem with forensics and computational methods - including machine learning, natural language processing, and data mining - to inform, enrich, and augment digital preprocessing and

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processing tasks attuned to notions of contextualization [Xu et al. 2011] [Esteva et al. 2013] [Hutchinson 2020].

Birthed in ideas from the profession's European antecedents, American archivists draw from two fundamental principles under the banner of 'provenance' to steer archival work, and the performance of such, away from hazards that could decontextualize the information under its control. The principle of *respect des fonds* dictates that "records of different origins (provenance) be kept separate to preserve their context" [Pearce-Moses 2005, 317]. The principle of original order dictates that "the organization and sequence of records established by the creator of the records" must be maintained [Pearce-Moses 2005, 280]. While once static and tightly circumscribed, the impact of ongoing technological, societal, and disciplinary development has extended archivists' understanding of these concepts over the past sixty years. The result is an expansive set of entity relationships to be explored and described tying analog and digital records not only to bureaucratic and administrative structures, but to networks of surrounding and contextualizing forces and behaviors including the social and technical practices in which records participate; the communities, cultures, and subjects that co-create and locate the records; and the archivists, readers, and other users who animate the record bringing it once again to life [Trace 2020a] [Trace 2020b].

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Figure 3. Frank B. Crawford reinforcing a document with crepeline in the National Archives Division of Repair and Preservation, 1940. National Archives ARC Identifier 3493246.

In the analog and the digital world there is a distinct physicality to all aspects of processing, although this work is obscured or rendered invisible from public view, happening as it does in the private staff areas of the archive. In this private space, processing acts as what is called a 'concealed tool,' part of a long-established tradition of maintenance and repair [Graham and Thrift 2007]. In terms of preservation, repair is a bench activity for analog materials and a technical and forensics process for objects born within digital space; the site of repair taking place at the processing workbench and the digital archive workstation, respectively. In the work of repair, as Stuchel notes, the emphasis is on "human purposes," a stance that neglects the reality that objects "change in ways proper to their materiality without regard for our desire to remember and prove" [Stuchel 2020]. Indeed, Stuchel's [Stuchel 2020] work highlights the tendency for archival things to be viewed as resources to be fixed and mined, rather than as part of vibrant and diffuse "other-than-human" components that engage and influence the world. It is the difference between a values-based approach that seeks to preserve the past by mitigating depletion and loss and a living heritage approach that sees change as a fundamental aspect of continuity [Poulios 2014]. In effect, the idea of decay exists as dueling notions - as a natural state of being in the world and as an imperative that archivists strive to subsume through maintenance and repair strategies.

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In the bench work that has traditionally encompassed repair, archivists engage in micro-processes, physically inspecting the records and carrying out technical preservation and conservation treatments to minimize deterioration of materials (and the information they carry) and maximize their projected life span. Co-opting the words of Dant, this benchwork shows that "the work of repair takes ingenuity in identifying the problem and then a wide range of skills and tools to make the object useable again; it involves a mixture of perceptual, cognitive and manual skills that are normally

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associated with handcraft” [Dant 2010, 97]. The notion of repair is so ubiquitous in the digital realm that systems are designed to supplement the work of the archivist in the form of “automatic self-repair” [Graham and Thrift 2007, 5] indicating when digital files are corrupted, in need of restoration or replacement. The job of maintenance – of “arresting a cultural object in time, maintaining it as closely as possible in the state in which it was created” [Galloway 2017, 7] - is especially critical for digital objects given their volume, complexity, and fragility. Indeed, as Trace [Trace 2011] and Galloway [Galloway 2017] note, the work of maintaining digital objects requires the archivist to get below the digital interface to the mechanism, documenting and preserving the hardware and software contexts that shape digital objects and give them life.

If, “in order to operate over long periods of time, old infrastructural designs must be constantly retrofitted to meet new contingencies” [Howe et al. 2016, 7], the ascendancy of born-digital materials shows how the archival infrastructure alters and improvises as archival labor flexes its creativity in response to technological provocations. Deciding which version of a software environment to document is a particularly complex problem given that elements of the originating software and hardware stack likely evolved at different rates over the life of the digital object [Galloway 2017]. As Galloway [Galloway 2017] indicates, the practice of maintenance under these conditions requires craft work attuned to preserving both the digital output and the human input into legacy systems. In the first sense this entails homing in on the set of rules or standards that best represents the originary (or temporally situated) software environment and installing it on legacy systems for testing. In the second sense this craft work entails untangling interpellations, including “the shaping of the user by the machine”; the “complex conversation” in which actions can be read “not just from the machines themselves but from those who made them and those who use them” [Galloway 2017, 15]. At a broader level, archivists have also responded to the digital transition by retuning descriptive practices to model the multifaceted contexts in which digital information resides; contexts that are increasingly understood as dynamic and unbounded, best architected in networked form. Such ongoing adjustments to archival processing are evident, for example, in the newly released *Records in Context* conceptual model and ontology; work that comes out of the Expert Group on Archival Description (EGAD) established by the International Council on Archives (ICA).

In all this work archivists not only seek to fix the material object but the negotiated order around it. The notion of an attempted material and social repair is ever present here. Archivists understand that the creators’ original recordkeeping structures atrophy when removed from their original context, and materials themselves succumb to the elements and degrade over time. In their mind, archival maintenance “occupies” and “constitutes” what Jackson calls “an *aftermath*” [Jackson 2014]. The repair in this instance is an attempt to heal the rift in space and time that has opened between the materials as created and the materials as archived and used. It is an attempt to connect the materials to a creator, an activity, a place in time, and to a condition where they have the most meaning, allowing them to be brought to life again by those who frequent the archive. Throughout this physical and intellectual process, material traces of the repair explicitly and implicitly recede from view, an instantiation of the professional role ceded to and negotiated by the technical workers in the archive as it exists in a delicate balance between discretion and legitimation. While the agentic work of the archivist is pellucid in the processing manuals and descriptive standards documentation that accompany the work, the professional containment of such skills and knowledge means that it often goes unnoticed and unacknowledged by the scholarly communities that archivists exist to serve.

Conclusion

In 2020, AI researcher Timnit Gebru and computational social scientist Eun Seo Jo called for the creation of a new specialization within machine learning to focus on the ethical collection and annotation of socio-cultural data for AI research and systems. In this scenario, archives are given recognition as “the longest standing communal effort to gather human information” with the language and curatorial procedures honed by the archival profession said to demonstrate the sophistication necessary to serve as the framework for this initiative [Jo and Gebru 2020]. Yet, the same respect for the archive as infrastructure and for the intellectual and physical labor of the archivist attuned to infrastructural maintenance and repair has been largely absent from scholars in the humanities.

In talking about humanities infrastructure, Anderson reminds us that “if research infrastructures are to contribute to the transformation of research then it is important that researchers working on histories, literature, culture and other aspects

of what makes us human understand the value of these infrastructures for their own practices and how they operate to facilitate and to enhance the production of their research” [Anderson 2013, 7]. This article has set out to review the key reasons why historians and other humanities scholars should continue to pay attention to the infrastructural and maintenance work of the archive as it supports and extends humanities research into and through the digital era. Co-opting Downey’s insights into the nature of cultural heritage work, we can say that the importance of the archive and of archival information labor lies in its ability to allow analog and digital information to continually circulate and have value in society. It does this by providing information – “cast as data, content, or knowledge” — with a way to jump contexts across time, space, and disciplines, transposing information from the past into the future, from one kind of institution or intellectual domain to another, and from one kind of cultural and social milieu to another [Downey 2014, 152]. It is an acknowledgement that the humanities have meaning broader than innovation, with an emphasis on articulating how the archive sustains the notion of the humanities-in-use.

In a 2018 article, Russell and Vinsel [Russell and Vinsel 2018] asked us to consider: Where is maintenance work performed? What is being maintained? How is maintenance work organized? Who are the maintainers? Who pays for maintenance? Who benefits and who does not? This article has drawn attention to the nature of archival life as it helps to create and exist in and alongside the infrastructure of the humanities. It is a reminder that archivists are the workers that seek to maintain and repair an infrastructure in service of others. It is a reminder that it is archival labor that enables key processes required of humanities scholarship, including authentication, contextualization, and preservation of primary source material whether analog or digital in nature. It is a reminder that in the resource-constrained discipline that is the humanities the resilience of its research infrastructure is performed by the archival community despite the often fraught and precarious nature of maintenance and repair work.

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To look into the future is to conceive of what could be and what can be brought to pass. The archive and the archivist have always taken the long view, imagining a future in which the archival record, no matter its underlying technology and lineage, is secure in its context, permanently available for whatever use a person can conjure. Humanities scholars are long overdue in joining the archival profession in this imagining. It is time to think about what the future of the humanities could look like if the archive is recentered as the enduring mechanism that drives humanities work and scholarship and whose longevity, endurance, and transformation archival labor has long sought to guarantee.

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Notes

[1] An early draft of portions of this work [Trace 2019] was presented at the Maintainers III Conference, Practice, Policy and Care, Washington, D.C., October 6-9 2019.

[2] The Society of American Archivists *A Glossary of Archival and Records Terminology* defines archives as “Materials created or received by a person, family, or organization, public or private, in the conduct of their affairs and preserved because of the enduring value contained in the information they contain or as evidence of the functions and responsibilities of their creator, especially those materials maintained using the principles of provenance, original order, and collective control; permanent records. - 2. The division within an organization responsible for maintaining the organization’s records of enduring value” [Pearce-Moses 2005, 30].

[3] NARA, “What’s an Archives,” <https://www.archives.gov/about/info/whats-an-archives.html>.

[4] The examples from Brymner and Jenkinson are provided in Nesmith [Nesmith 2002].

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