Experimenting with the Archive: STS-ers As Analysts and Co-constructors of Databases and Other Archival Forms

Claire Waterton

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Experimenting with the Archive: STS-ers As Analysts and Co-constructors of Databases and Other Archival Forms

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Abstract

This article is about recent attempts by scholars, database practitioners, and curators to experiment in theoretically interesting ways with the conceptual design and the building of databases, archives, and other information systems. This article uses the term "archive" (following Derrida's *Archive Fever* 1998/1995 and Bowker's *Memory Practices in the Sciences* 2005) as an overarching category to include a diversity of technologies used to inventory objects and knowledge, to commit them to memory and for future use. The category of "archive" might include forms as diverse as the simple spreadsheet, the species inventory, the computerized database, and the museum. Using this protean concept, this study suggests that we are currently witnessing a time where close convergences are occurring between social theory and archive construction. It identifies a "move" toward exposure of the guts of our archives and databases, toward exposing the

[1] Department of Sociology, Lancaster University, Lancaster, United Kingdom

Corresponding Author:
Claire Waterton, Lancaster University, Lancaster LA1 4YG, United Kingdom
Email: c.waterton@lancaster.ac.uk.

contingencies, the framing, the reflexivity, and the politics embedded within them. Within this move, the study examines ways in which theories of performance and emergence have begun to influence the way that archives of different kinds are conceived and reflects on the role of Science and Technology Studies (STS) scholars in their construction.

Keywords
databases, archive, memory, performance, emergence

This article is about recent attempts by scholars, database practitioners, and curators to experiment in theoretically interesting ways with the conceptual design and the building of databases, archives, and other information systems. The article uses the term ''archive'' (following Derrida's *Archive Fever* 1998/1995 and Bowker's *Memory Practices in the Sciences* 2005) as an overarching and protean category to include a diversity of information and knowledge-based technologies. In the article, I highlight examples where I see close convergences occurring between social theory and archive construction. Even within the most impervious of information, database or archival sciences, many of the developments in theories of representation, interpretation, performativity, and emergence now seem to be informing the ways that databases and archives are being designed and used.[1] This should be seen within the context of a rapid development in information and communication technologies more generally—referred to by some scholars as the ''informational turn'' (Beaulieu 2004).

Some of the convergence between the world of social theory and those worlds concerned with building archives is relatively recent, and much of it has occurred without explicit reflection. In 2002, the archivist Elisabeth Kaplan made the observation that despite the deep upheaval caused by the crisis of representation in cultural anthropology (and subsequently most of the social sciences and humanities) in the latter half of the last century, archival thinking, in contrast, had remained unperturbed, ''largely impervious to these debates,'' and ''bound up in modes of thought and practice distinctly rooted in nineteenth century positivism'' (2002, 210).[2]

In my area of interest which is the construction and interpretation of databases of nature, it is again notable that developments taking place in a social theoretical domain have occurred largely isolated from, and unnoticed by, the majority of agencies, government departments, individuals and

scientific groups that have been working with information technologies to create databases designed to represent the state of the natural world.[3] Social theory has not naturally traveled into the worlds of European biodiversity databases, Geographical Information Systems, national species inventories, and so on, although some Science and Technology Studies (STS) practitioners have recently begun to bring these epistemically foreign worlds together (Bowker 2000, 2005; Baker et al. 2005; Baker and Stocks 2007; Ribes et al 2005; Waterton 2002; Turnbull 2003; Maturano and Chadwick 2004; Maturano 2003; Boast, Bravo, and Srinivasan 2007). These recent studies have begun to emphasize performativity and emergence as integral to the database.

In this artilce, I reflect upon three examples of an active experimentation with the collection, representation, and display of data about natural/social worlds, which are partly informed by the work of STS and partly by other influences, including social theory. Each example presents different ways in which the idea of the archive is the subject of an ongoing experiment. The first example (which, once observed by the author, became a catalyst for the writing of this article) concerns the ''Darwin Centre,'' a new building that forms part of the vast archive of specimens and their associated names and taxonomies housed within the Natural History Museum in London. The second example examines an attempt to rethink the theory and practice of making databases designed to record human and biological diversity. The third example explores the bringing together of theory and design in the construction of a new digital archive within an aboriginal community. This new archive is being theorized and made by an aboriginal community together with nonaboriginal Australian STS and linguistics researchers.

Each example illustrates ways in which the epistemology and ontology of the archive are being reworked. Through these examples, I identify a ''move'' that seems to be integral to all three cases—a move toward the exposure of the guts of our archives and databases, toward exposing the contingencies, the framing, the reflexivity, and the politics embedded within them. This reworking can seem progressive, expansive, and inclusive in that the resulting archive demands a multilevel, dynamic, and ongoing performance. By celebrating performance and emergence within the archive such a move seems to belong to a new cultural age, characterized itself as a complex system in which the key dynamic (even of scientific facts or data) is open-endedness and recursivity (Hayles 2005, 28). However, this move and the performative, generative archives that result from it might be interpreted in a more conventional way. That is, we may suspect that the open-endedness and the performative and generative aspects of

these new forms of archive do not really reveal any more than conventional archive forms. We may even suspect that they obscure some fundamental realities: that all archives both reveal and hide, that all archives harbor their own tacit politics, histories, and powers.

The fact that individuals, research teams, and institutions *are* experimenting with digital and other material and political forms of archive forces us to imagine both of these possible reactions and interpretations. Either way, this study argues that we need new, culturally deeper ways of "reading" archives (including the mundane "database") so that we can get a grasp not only of the complex processes which constitute the making of "the record," but also of the ways in which these archives, beyond their immediate performative effects (in making memory of biodiversity, cultural diversity, and so on) implicitly project and perform ideas of the human subject, ideas about how we can and should live in the world.

"The Archive"

As suggested in the introduction, I want to think, for the purposes of this study, about artifacts like lists, spreadsheets, databases, or even museum buildings as different forms of *archive*. I have been inspired to do this through reading Derrida's *Archive Fever* (1998/1995) and Geoffrey Bowker's *Memory Practices in the Sciences* (2005), which builds on Derrida's work. In *Archive Fever*, Derrida characterized the archive as a kind of "technoprostheses" (Derrida 1995, 34) in time and space of our knowledge or experience of the world. One of the most common understandings of the archive is that of a kind of receptacle, a "store" (Derrida 1995, 22). Derrida traces the meaning of the term archive back to the Greek root *arkeion*, meaning house, domicile, the residence of the superior magistrates, the archons, those who commanded. This archontic dimension, he suggests, drives, in part, the logic and semantics of the archive: "of memory and the memorial, of conservation and of inscription which put into reserve, 'store', accumulate, capitalise, stock a quasi-infinity of layers, of archival layers that are at once superimposed, over imprinted and enveloped in each other" (1995, 22).

Through their container-like symbolism and meaning, archives (including electronic databases, for example) can be seen to perform specific spatialities in knowledge production and representation. They build upon deeply held, spatially segregated, cultural understandings of knowledge whereby certain forms of "raw data" are gathered "in the field," through experience of life and of the world. Data are then condensed and curated in places "set apart"—the monasteries, science parks, ivory towers, the

back rooms within museums, and research centres—the places where, nowadays, databases are built (Outram 1996, 259-61 in Massey 2003, 72-3). The enlightenment panoptic project of assembling all knowledge in one place has overwhelmingly informed the archetypal archive as well as our stereotypical ideas of it (Turnbull 2003, 1; Richards 1993).

Taken-for-granted concepts of time within the archive can also be unraveled. The archive can, in important ways, be seen as a kind of (epistemic) time machine. In our vernacular understanding of them, archives have usually been understood to store present and past experiences and knowledge of the world for some use in the future. The archive, writes Derrida, "has always been a pledge, and like every pledge, a token of the future" (1995, 18). In addition, attached to this token has been "the question of the future itself, the question of a response and of a responsibility for tomorrow" (1995, 36). There is also the question, of course, of "memory," what "bits" of the past should be laid down, how should experience of the world be ordered, classified, made to represent? These questions pertain to all kinds of archives. Databases, as specific kinds of archives, for example, have had, by their very nature, to be built on some kind of guesswork, some faith, that we are doing this right, that we are entrusting and layering things and meanings that will be interpretable and meaningful in times to come. Archivists appear to be becoming increasingly critical and reflexive about the kinds of entrustment and temporal laying in which they are involved (Cook and Schwartz 2002).

Furthermore, in the sense that they are technologies for making representations of the world, I have found it useful to think of archives of all forms as examples of the "mimetically capacious machines" that Taussig describes in *Mimesis and Alterity* (1993, xiv). Conventionally, archives (and databases within that category) use culture to create copies of nature, or "second nature" as Taussig would put it (1993, xiii). These copies, and the archive or database itself, can be seen as an important *border* between knowledge of self and knowledge of the other, maintained by a sense of alterity/other. Yet, Taussig argues, this border is currently unstable; the border zone of representation is currently expanding, proliferating, and blurring, becoming permeated by itself. Its current diffusion "to cosmic proportion" (Taussig 1993, 251) is occurring through new technologies that archive and perform the world in increasingly dense and cross-cutting ways. Mimetically capacious machines—cameras, computers, credit cards, digital media, printers, faxes, televisions, teleconferences, e-mail, etc. —are creating new conditions of entanglement in which "boundaries of all kinds have become permeated by the supposed other" (Hayles 2005, 242). Hayles writes, "Code

permeates language and is permeated by it; electronic text permeates print; computational processes permeate biological organisms; intelligent machines permeate flesh." (2005, 242). The border itself has become "phantasmic reality," "unreal, micromental and elusive" (Taussig 1993, 251). As Derrida suggests, all this constitutes an "unlimited upheaval" in archival technology, conditioning our research into the past and thus our anticipation of the future (1995, 17-18).

Two strands of contemporary social theory seem to be more important than others for the interpretation of current tinkering and experimentation with the idea of the archive. The first is the notion of performance and performativity, and the second is the notion of emergence or generativity.

Performativity and Generativity within the Archive

Performance and Performativity

The term "performance" has come to represent a number of different meanings and interpretations in the social sciences in the last few decades (Williams 1976; Szerszynski, Heim, Waterton 2003, 2; Bell 1999; Carlson 1996; Thrift and Dewsbury 2000; Dewsbury 2000). As Szerszynski, Heim, and Waterton note (2003, 2), overviews of this term generally introduce it as a concept best captured by process. Performance is something done, an activity. We can use this concept to endow liveliness, action, and agency to categories traditionally deemed inert, noun- rather than verb-like. Using the concept of performance, objects, passive subjects, nature, technologies, speech can all be seen to be active agents, performing certain kinds of reality.

The related concept of "performativity" helps to express the idea that the doing of such things is conventionally carried out in a context, which is anticipatory of that which is meaningful by others. Objects and categories are only really present in "the doing of them," they have to be continually performed to exist at all (Szerszynski, Heim, Waterton 2003, 2-3), and performances of them are carried out in relation to other human-subject performances (Butler 1990, 1993, 1997). This notion of performativity has transformed our understanding of a diverse array of social and natural issues: speech and speech acts (Austin 1962), gender (Butler 1997), the body (Grosz 1995), and nature (Szerszynski, Heim, Waterton 2003). Performativity implies that things need to be done and redone to have a presence in the world. However, this does not necessarily mean that they are identically replicated: change is also integral to this doing of things. Even though

performance is sometimes interpreted as a script precisely followed, it is a term that allows for agency and change, for the new to enter in, even within a repetition of action. Performances, in other words, always end up being subtle and flexible improvisations rather than strict replications of existing realities. Using the concept of performativity, we can see the archive as a technology that constitutes not only a record of our representations of the world, but as an active and iterative making of the world and of entities and selves within it.

An important contribution of STS to this understanding of performativity has been to examine and highlight the performative role of material elements in cultures of knowledge making. Star focuses on the physical materialities of databases in a way that reveals the social and political embedded within them. Her interest is in the performative consequences of these materially embedded norms and politics (Star 1999). Databases, archives, and information systems are made up of textual data and material things (such as specimens) as well as higher orders of information called "metadata," and are intertwined with what Star (1999) has named infrastructure—the lists, codes, technical specifications, and other hidden mechanisms and standards that make the database work, both for those constructing the database and for those potential "users" that will one day want to retrieve information from it. It is here, in the hardwiring of these systems, that the gritty politics, the intricate and negotiated norms, inner polities, and imagined and projected futures are located. "Study an information system and neglect its standards, wires and settings" suggests Star, "and you miss equally essential aspects of aesthetics, justice and change" (1999, 379). The study of Friedman and Nissenbaum (1996) on the "bias" inherent in the hardwiring of information systems in areas like air ticket purchasing and the work of Introna and Nissembaum (2000) on the politics embedded in the Google search engine are further examples of work that attends simultaneously to the material, the political and the normative bound up and performing together within databases and data management systems.

In addition, there are what Butler would call transgressive performances, ones that contest previously unquestioned conventions[4] (Cook and Schwartz 2002, 177). STS, again, has looked in detail at the idea of a transgressive performance as one that might centre around the materiality of such technologies. Understanding technology as intersubjective performance (Pfaffenberger 1992; Lorrimer and Lund 2003) has meant that the supposed political forces of an artifact can be regarded as an "affordance," a perceived property of that artifact that suggests how it should be used. An artifacts' political affordances, suggests Pfaffenberger, are inherently

susceptible to multiple interpretations (p. 284). These shift over time, moving beyond the "opening" moment of innovation to "user appropriation, user modifications, sabotage, and revolutionary alterations" (Pfaffenberger 1992; see also Bowker 2000, Waterton 2002 with reference to databases). Pfaffenberger (1992) sees the whole unfolding scenario of the innovation and responses to it as a technological drama that opens out into the future.

Ideas of performance, intertwined with broader theoretical concerns, have been applied specifically to databases in increasing density in recent years, just as databases have themsleves been recognized within the social sciences as significant and worthy objects of study.[5] Databases in our present information-dependent and information-saturated times are now argued to semiotically, materially and performatively order the world, both in terms of a world past (databases hold records, memories of the world: Bowker and Starr 1999; Bowker 2005) and in terms of future worlds (Derrida 1995). Bowker has suggested that contemporary databases, seen as the culmination of a long line of various information technologies, might now be recognized as "perhaps the most powerful technology in our control of the world and of each other" (2005, 93).

It is clear in the twenty-first century that different forms of archive, including database technologies, are proliferating and performing almost beyond our imagination of what that means for the ordering of human and other life/nonlife forms. It takes only a glance in the direction of biological, organizational, personal, medical, and other database platforms and technologies to see that database/human/multimedia entanglements and performances are becoming much more improvisational than scripted (Jensen 2005; Maturano 2003; Maturano and Chadwick 2004; Szerszynski, Heim, Waterton 2003). These improvisations, the instabilities and unpredictabilities of our archival performances, and their effects and interpretations, perhaps by now even feel an integral part of our technoscientific culture.

Emergence and Generativity

> Imagine a square grid, with each square representing a cell that can either be "on" or "off"; further suppose that we represent those states as black or white. An initial state is defined for each cell, as well as a set of rules telling each cell how to update its state. For example, a cell might have a rule that it is "on" if two or more of its four neighbours are "on"; otherwise it is "off". Each cell in parallel then canvasses the state of its neighbours and updates its state accordingly, while all of the other cells do the same. This update results in a new state for the system, which transforms in yet another iteration during

> which again all cells again canvass their neighbours and update their cells accordingly (Hayles 2005,19)

The excerpt above tells the story of the behavior of cellula automata, physical things/signs/rules that illustrate some of the close connections between theories of performance (the cells canvassing the states of their neighbors) and those of emergence (cells updating their state iteratively). The story above is reported to have generated much excitement in circles of computer theory through the idea that simple rules can generate complexity through computational means. Ideas of emergence and generativity have also generated a good deal of excitement in social theory in recent years. It is the insistence of things being "in play," constantly generative of new circumstances with their own consequent thing-like effects spinning off from them, that is important here. The writing of Deleuze and Guattari, for example, has been a powerful and influential example of generativity. In *A Thousand Plateaux*, the authors celebrate the interaction of machine and the human in a way that forces a rethink of questions of emergence and the generativity of machinic/lively patterns. In re-conceptualizing the boundaries between humans and things and in upsetting our received wisdom about agency and control, they place animate and inanimate life into what Clark calls a new "philosophy of becoming" and open out our understanding of social theory by emphasizing not only the play of words, but the "play of the world" (Deleuze and Guattari 1987/1980, 69, in Clark 2003, 31).

An important aspect of generativity is the distinction, made by Deleuze in *Difference and Repetition* (1994/1968), between depiction of the world, on one hand, and *creating the conditions under which new things come into existence*, on the other: "if our objective is to depict the world, then, no matter how rich the world appears to us, we will only have as tools what already exists or what has already taken place. However, if we are concerned with thinking about the conditions under which new things come into existence, we can actually see ourselves become part of those creative happenings—part of the bringing of 'something to life'" (Deleuze 1994/1968, 147 cited in Clark 2003, 30).

If Deleuze and Guattari (1987/1980) have made a major contribution, among others, to our understanding of social theory by opening the play of words to the "play of the world," they have also been part of a network of others within social theory that have insisted on keeping in focus material, rather than simply textual, and ontological rather than simply epistemological relationalities. Feminist, science studies, and queer theories have all brought to the fore ways in which the very materialities of technologies are "generative" in an intricate and unpredictable interplay with the world,

but with a world that itself is undergoing a constant process of "becoming"(Barad 2003, 803; Haraway 1997, 1988; Grosz 1999). This specific emphasis on materialities means that the nature and stuff of the technologies, and their "hard-wiring" matter, and not just for epistemological reasons. Matter matters as Kearnes (2003) has put it, and, as an agent, is allowed "its due as an active participant in the world's becoming, in its ongoing 'intra-activity'" (Barad 2003, 803). As Barad's theory of agential realism would have it, "which material-discursive practices are enacted matters for ontological as well as epistemological reasons: a different material discursive apparatus of bodily production materialises a different agential reality ... Agential reality is not about representations of an independent reality but about the real consequences, interventions, creative possibility of intra-acting within the world" (Barad 1998, 7-8).

What do the ideas of emergence and generativity mean, though, for the overarching idea of the archive? The concept of the archive—as a kind of "ark" (to trace one of the other derivations that Derrida draws upon (1995, 23), which can be entrusted to yield up consigned knowledge in the future—now feels out-of-date, newly vulnerable, both in the tangle of technologies that break down received wisdom about the temporalities and spatialities of knowledge production, but also in the concepts and ideas available with which to think about data, databases, and the many other forms of the archive. In technological terms, we are caught in the present time within what Michael Taussig has called a mimetic excess, surrounded by and implicated in information technologies in ever-evolving new forms, leading to a "surge of mimetic sensitivity," a "self awareness, mimesis turned in on itself" (Taussig 1993, 252). In conceptual terms, our representations and the related achievements that we call "data," "information," and "knowledge" have become chronically performative, contingent, and emergent, interacting with a world which itself is in an eternal process of becoming.

With these twin technological/conceptual shifts there is a profound epistemological and ontological restlessness, a sense of ever moving on. The performative and the generative theories of social theory are full of possibilities: they allow nature and things to act up, to speak up, to kick back, they allow nonhuman nature (including technologies like databases and material bits of databases like codes and wiring) to "co-fabricate" the world (Stengers 1997) and the creative potential of the world. Some would suggest that this is already happening. The "informational turn" in biology (Wouters and Beaulieu 2006, Beaulieu 2004) characterizes a situation in which, among other things, genetic data bases become a platform for generative exploration rather than a mere documentation of facts

(MacKenzie 2002,194). Web-based infrastructures in biology and genomics link up and provide access to a vast array of other different databases and data frameworks; and databases and collections such as biobanks play an important part in aligning and bringing together multiple different interests in areas such as biology, clinical work, and public health initiatives (Ratto 2006, 41). The informational turn in areas like biotechnology and genomics is both performative and generative. It consists of a fecund coproduction between life, information infrastructures, and the emergent socio-technical worlds of biological innovation, exploration, ''biocapital'' and much else besides (Haraway 1997).

Above all perhaps, the informational turn in biology and biotechnology is cutting edge, incomplete, pushing at the limits of what we know, what we and technologies can do, and who we can become. It is, in this sense, experimental. In the same way, the examples I present below are further experiments with the archive. In these examples, I aim to highlight the conceptual, material, and epistemic ways in which performativity and generativity are becoming parts of our contemporary archives, making our archives appear less container like, more open and perforated, more accessible, more improvisational, more unpredictable and fluid than they have previously been.

Experimenting with the Archive: I

A public performance. The example below treats a museum (London's Natural History Museum) itself as a vast archive and examines certain specific architectural, material, and conceptual shifts that have occurred within it. These recent shifts illustrate, I think, ways in which performativity and generativity are becoming part of the very fabric of the idea and the reality of the archive.

Anthropologists and social scientists have long been interested in museums as places of meeting between cultures and as sites of staged encounter between people with different knowledge traditions. In recent years, we have seen, however, a new energy within this work around the democratic potential of digital museums (Srinivasan and Huang 2005), museums as contact zones in which dialogue occurs (Clifford 1997), museums as inventing new roles which challenge traditional associations of museum culture and practice (Huyssen 1995; Witcomb 2003; Macdonald and Fyffe 1998, Clifford 2004; Preziosi and Farago 2004).

In this context, it is interesting to examine the manner in which the Natural History Museum in London is reorienting the fabric of its buildings

and infrastructures to reinvent the border between the public and those who do biological research within the Museum.[6] The Natural History Museum in London houses a collection of over 70 million natural history specimens, an archive that has been procured over the last two and more centuries from countless countries across the globe and traditionally curated "behind the scenes" in the laboratories, basements, and libraries that exist shut away from the public exhibition space of the museum.

On September 30, 2003, Phase One of a new purpose-built wing of the museum, the "Darwin Centre," opened up the collections and research of the museum to the public view in unprecedented ways, bringing together three ingredients—architecture, visitor experience, and the collections—to achieve a new "vision" for the Natural History Museum.

> The Darwin Centre is central to our vision, showing to the public for the first time a major part of our research collections, housed in ideal conditions. Our scientists will have new laboratories and visitors will be able to interact with these expert staff in ways that will break down traditional barriers. (Natural History Museum [NHM] Annual Report 2001/2002, 3)

The Zoology Department had worked for two years previous to achieve the transfer of 22 million specimens from the old "Spirit Building" to the new Darwin Centre. The idea behind this move was partly to secure optimum storage conditions for specimens, many of which needed rehousing in new stainless steel tanks and maintaining at optimum temperatures if they were to continue to be preserved into the future. However, there was also a further ambition: it aimed to bring people "closer to the scientists' research and provide access to one of the finest collection of natural history specimens in the world" (NHM/BBC Wildlife 2002, 2).

The Darwin Centre was intended to redefine the popular concept of, and access to, the collections and the museum itself. The architecture of the building was designed to facilitate this shift: the Centre and even the boundaries within it are largely made of glass. The physical transparency of the building plays neatly into a metaphor of greater epistemic transparency and exchange between researchers and publics.

> The glass walls and open shelves on the visitor floor of the Darwin Centre allow visitors to view specimens that were previously only seen by the museum's scientists (NHM/BBC Wildlife 2002, 26).

What was engineered through the Darwin Centre's structure and facilities was a more interactive, performative space through which "the public"

could not only see the national archive, but enter into dialogue with its scientists and researchers, hear public lectures on current research, watch Web-casts from the Museum's research stations across the globe, take part in debates and behind-the-scenes tours through specimen store rooms and the backstage spaces of the museum collections (NHM/BBC Wildlife 2002, 4, 35; NHM 2003).

I suggest here that the Darwin building appears in many ways as a material manifestation of the urge to render the guts of our archives transparent, to reveal the inner hierarchies and structures of natural history knowledge-making, and to create new performative and generative possibilities between experts and lay people. The example is suggestive rather than definitive and raises some interesting questions. For the NHM, this move occurs under the banner of "science in society" and is one example of the Museum's enthusiasm to reduce the seeming chasm between the publics who walk through the front entrance of the Museum and the researchers who work in the laboratories and offices behind the public exhibition spaces. At the same time, the Darwin Centre can be seen as an attempt to eschew the security of a traditional, colonial-infused version of the natural history archive and to experiment with a new identity.

NHM researchers' work in collecting, curating, and taxonomising (to mention just one trail of activities that constitutes the research of the Museum) no longer serves a colonial polity. It continues, however, as work that constructs the NHM as pivotal to British science, to national and global understandings of biodiversity and hence of invaluable use to public policy. Keen to reflect these new imaginings and purposes of the scientific work that goes on within the Museum, the example of Darwin Centre Phase One is symptomatic of a general tendency to experiment and rethink "the idea of the museum," to "reimagine" the archive in ways that are sympathetic to post-colonial sentiment and realities (Witcomb 2003; Preziosi and Farago 2004). The redisplaying of hundreds of specimens within a glass-structured, transparent building (where the glass jars of the spirit collections are for the first time observable in the laboratory setting, and where the movements of curators and archivists are also on public display) seems to me a signal of an awakened sensitivity to the traditional hidden power of the archive, an impulse somehow to "have it all out in the open" to let "the public" into the inner sanctum, the arkeion and to make room for new performances within that new material and epistemic space. Through the Darwin Centre, the NHM is reinventing its practices, deliberately recasting its spatio-temporal practices of expedition, retrieval, and storage, and inviting its public to take part in a performative re-rendering of the archive.

Experimenting with the Archive: II

Databasing diversity. We are entering a new era of mapping and databasing where it may now be possible to find ways in which local mapping traditions including that of western science can work together in productive dialogical tension and in so doing we will create a new form of mapping, a new form of knowledge and a new form of innovation based in the concept of emergence (Turnbull 2007, 17).

My second example of experimentation with the archive concerns the desire of an STS scholar, David Turnbull, to rethink the way in which biological species, their diversity, and the process of their diversification are characterized in database form. In a piece designed to explore the possibility of constructing a database that can deal with performativity of life itself, Turnbull notes that performative and generative understandings of life have long since gone right to the heart of biologists' and philosophers' taken-for-granted units such as "species" (Turnbull 2003). Biologists have for some years now been questioning the kinds of narratives told about organisms as fixed entities and about the assumed relationship of organisms to their environment (2003, 5). Turnbull argues for a radical re-shaping of the species database, working with the insight that the concept of a species is nothing more than an assemblage of diversity. A species in these terms is a temporary achievement of sameness within a flow of difference.

> . . . there are no grand divides; there are only interactions, processes in place, and across space and time. Speciation and diversification occur as a result of changing genes in an historically contingent environment. (Turnbull 2003, 6).

Turnbull wants this generative concept of life to spill over into the thinking behind the making of databases of natural and cultural diversity. If we understand the nature of biodiversity performatively, as a "dynamic system" built through processes of interaction and mobility, and shifting over time as interactions, go-betweens, and contingent "naturecultures" emerge, why do we construct the need to inventory species diversity, and how should this be done?

Turnbull is going against the grain of a long tradition of pragmatism in biology in this respect. The biologist Ridley writes, "In evolutionary biology, the interesting questions about species are theoretical. The practical question of which species should be classified into which species can on occasion be awkward, but biologists do not tie themselves in knots about it." (2003, 377). Turnbull's writing suggests, however, that he considers it insufficient to think pragmatically here. He would disagree not only with

Ridley here but also with those that have considered the policy relationships to the species concept—those that consider, for example, that biodiversity needs at the very least to be inventoried through dominant species concepts if its significance in public policy is to retain purchase (an argument made by Bowker 2000, 2005). Not content to see this as a practical issue, Turnbull wants to push the interesting theoretical questions in biology into questions of ordering and representation in database form. His concerns about the performativity of the species concept run deep, leading into anxieties about what the naming and inventorying of species might imply for the future of those species and our knowledge of them. If conventional databasing practice implies that "other" conceivable categories, such as those relating to process and emergence, will be left out, then he wants to look for alternatives.

Awareness that knowledge of biodiversity is increasingly linked to issues of cultural diversity, Turnbull brings to the fore the challenge of inventorying "diversity," and puts forward the possibility that diverse human conceptions of nature might share a space within a biodiversity database. One challenge might be to ask whether Turnbull's imagined open, fluid, and generative structures of human−natural diversity, given contemporary computational and databasing power and technology, can be "corporealised," somehow rendered as material-semiotic bodies (Haraway 1997,141) within a database, themselves generating more diversity of form. Turnbull suggests in making knowledge, and in making databases, we are making narratives of commensurability, making linkages and connections, and producing "cognitive trails" in conceptual space. What Turbull is really after, in his thinking about databases, is a way of working with incommensurability in knowledge traditions.

> "Can we," he asks, "imagine a database that does not reduce cultural [and biological] diversity by submitting different knowledge traditions to a one size fits all, lowest common denominator regime?" (2003, 20).

Turnbull's desire is to create "a database that includes a physical performance place, an interstitial third space, a trading zone in which differing traditions are narrated and performed together and in which actors can move, make connections, produce new spaces and trails" (2003, 21). The trading zone, as I see it, would allow the database not just to be a technology of memory and representation but to be one that is generative. In this sense, Turnbull's ideas are resonant with Deleuze's commitment to creating the conditions under which new things may come into life (Deleuze 1994/1968, 147 cited in Clark 2003, 30).

As yet, Turnbull's ideas remain at the conceptual level—it is not clear what the trading zone in which incommensurable traditions and performances can take place would consist of, or what a performative, emergent database of biological and human diversity would actually look like. Yet, he is not prepared to collapse ideas of performance and generativity into new human/machine signs and form—for example to create a database or electronic *model* of species interactions or cultural generativity. Turnbull's experiments with the idea of the archive aim, along with other database designers (e.g., Bonifacio, Bouquet, and Traverso 2002), for "semantic interoperability without semantics" (2007, 16), and for an embrace of the concepts of multiplicity, incommensurability, performance, and emergence in the production and archiving of knowledge about naturecultures. Like the experiment that I will describe in the next section, he maintains a commitment to the diverse human actors that might create the archive and to their own discursive traditions and ontological politics.

Experimenting with the Archive: III

Aboriginal knowledge and the building of databases. Databases are not innocent objects. They carry with them particular culturally and historically contingent assumptions about the nature of the world and the nature of knowledge; what it is, and how it can be preserved or renewed (Christie 2004, 1).

In this last example, experiments with ideas and concepts of the archive are being realized in the form of a Web-based database, through a project called Indigenous Knowledge and Resource Management in Northern Australia (IKRMNA), also known as "Making Collective Memory With Computers." Science and technology studies, linguistic, education research, and technical database expertises have combined within this project to create a fertile ground for experimenting with the theory and form of a database that is designed not for making representations but for "doing place."

The author of the excerpt above is a linguist and educational researcher at the Learning Research Group, Charles Darwin University, working together with Helen Verran, a philosopher and anthropologist of science (Melbourne University), a team of social scientific and database design researchers, and three other institutional partners on an Australian Research Council Linkage Project concerned to "develop Indigenous places and promote sustainable livelihoods for aboriginal people on country" (Verran and Christie 2007a, 9). From the funders' perspective, this project was designed

to help indigenous people in Australia with their own archives of indigenous knowledge. The project was conceived by the researchers in response to a plea from the aboriginal "Yolngu" communities in the northern tip of Australia. Aboriginal parents and grandparents had become concerned that the younger generation were not growing up with a strong indigenous knowledge/identity. They, therefore, endorsed the use of computer databases to store texts, photos, videos, maps, lists, and so on to help with their work of teaching (Christie 2004, 1).

> Our elders are getting very old, the teenagers today aren't interested in learning anything from them. We need to find good ways of keeping some of the knowledge of the old people of our country before they all pass away (Verran and Christie 2007b, 5).

Whilst understanding the drive for the use of computer databases within Yolngu community, Christie, Verran, and colleagues[7] are sensitive to the historical, cultural, and political baggage of databases—the ways in which their spatialities, temporalities, and materialities have worked toward a colonialist extraction of knowledge to serve powerful elites and centres in the world (Richards 1993). The research acknowledges these politics as belonging to database technologies, as well as belonging to the discourses of (sustainable) development that aboriginal databases are bound to (Verran and Christie 2007a). The research, however, reworks these politics, describing itself as deliberately starting off with the precepts and preoccupation of the Yolngu communities:

> . . . we're starting off with people on country doing what they're doing using digital technologies and then finding good ways of helping them do it (Verran and Christie 2007a, 3).

As such, a goal of the research has been partly to understand and work with Yolngu cultural needs and desires (for example those of the parents and grandparents above) but also, in the postcolonial, social, and political context within Australia, to understand what affordances a contemporary computer database might offer these people.

This project is interesting as it appears to serendipitously yet also skillfully exploit the diffusions and perforations of the mimetic, representational border that Taussig, Derrida, Hayles, and others have witnessed arrive with new digital and multimedia technologies. In his discussion of mimetic technologies in contemporary time, Taussig suggests we are presently in an era

of hypersensitivity to the mimetic relationships of the past. The "Reverse Contact now-time" as he calls it implicates us in an excess, "a frenzied stasis of interpretation, a profoundly reflexive late twentieth century [or, here, early twenty-first century] anthropology as the mimetic faculty is exposed, as never before, to the drunken see-sawing of the civilising dialectic that once fused nature with culture in a settled pattern of alterities nicely secured by the aura of 'first contact'. To become aware of the West in the eyes and handiwork of its Others, to wonder at the fascination with their fascination, is to abandon border logistics and enter into the 'second contact' era of the borderland where 'us' and 'them' lose their polarity and swim in and out of focus" (1993, 246). Taussig's characterization of the mimetic excess, although perhaps overly "frenzied" for the relationships between representers and represented that Verran, Christie et al. describe, does serve to describe very well the new kinds of patterning and layering, of technologies, spatialities, temporalities, epistemologies, and ontologies that the Web-based database IKMRNA began to involve.

Helping construct a single database of Indigenous Yolngu knowledge was soon revealed to be an "unrealisable fantasy" belonging to the funders of the IKRMNA research (Verran and Christie 2007b, 7). Such a database, containing "dead information" was also found to be of little interest to aboriginal workers on country. The researchers instead committed themselves to work with Indigenous knowledge work using digital technologies which was "already going on in-place." "An indigenous database," writes Christie, "must be a lot more than simply a conventional database full of representations of aboriginal knowledge." For it to be an indigenous database, its architecture and structure, its search processes and interfaces, its ownership and uses must also reflect and support context-specific indigenous ways of being and knowing, and people's control over their own knowledge (Agrawal 1995; Christie 2004, 5). To explore the ways in which the databasing project of Christie, Verran et al. encompasses ideas of performance and emergence, I look below at three different aspects of their work: first their use of the aboriginal concept of garma; second their use of the notion of galtha; and third their tinkering with database infrastructure, metadata, and database interfaces and structures.

Garma. The way in which identities are celebrated and maintained in Yolngu societies is in part through the ceremonial ground or "garma"—a flat and open ground on salt or clay pans, soft under foot. "The garma," writes Christie, "is a publicly recognized site for the negotiated performance of ceremonies. Yolngu from diverse land/language combinations,

come together and celebrate their samenesses and differences through collaborative performance'' (Christie 2004, 3). The garma inspires the rehearsing of collective memory as groups bring the ''past into the future'' (Yunupingu 1994a, b) through dancing, singing, painting, and talking.

Christie, Verran, and colleagues used the idea of a *virtual* garma to try to create a ''site'' within the database that is made from people's work, through human performance on the internet. Like the ''real'' garma, the virtual garma has specified codes for conduct and participation, as the following ''codes'' pasted on the IKMNRNA Web site make clear:

- ''This 'site' becomes a 'place' through human performance which make it meaningful. The garma is owned by Yolngu site makers, people are invited to participate in the performance space on the site if they do so with respect and good order. The knowledge here belongs to everyone who has shared in its production, and who acknowledge that it was produced through the goodwill and guidance of Yolngu teachers.
- The creation of a virtual garma would concern itself with the creation of a space—a site—on the Internet to which the routine practices of production and communication which reflect Yolngu protocol can be worked out.
- The virtual performance of garma on the Internet need not be in real time, but it must be ordered.
- The site must be approached through agreement and with goodwill and respect.
- The site becomes a garma through the careful implementation of protocols for performance, and the provision of rich networks of (hypertextual) linkages among these performances.
- The virtual garma needs to be first of all a space into which all people are invited to enter, and observe, and do their thing under supervision.
- It is not a community, it is a space to be created as a place through performance.
- The garma is 'owned'—maybe in this instance not by a particular clan group, but by Yolngu participants who work together to develop and maintain a Yolngu site.
- People are invited to participate in the performance space of the site if they do so with respect and good order.
- Land owners (totem holders, storytellers) make their representations first, and publicly, and others—Yolngu and others alike—are welcome to perform themselves or to sit at the edge and observe. The knowledge here belongs to everyone who has shared in its production, and who

> acknowledge that it was produced through the goodwill and guidance of Yolngu teachers."[8]

The virtual garma consists of resistance to the dominant, orthodox, understandings of a database, but this is self-consciously and reflexively not just a technical innovation: it is also working to reinstate a symbolism, ritual, and performance around the database that is consistent with existing symbolism and ritual within Yolngu culture. The virtual garma is deliberately conservative in some ways—it rehearses and does not challenge Yolngu traditions—while radical in others—breaking the concept of there being a master archivist in control of cultural representation and reproduction and opening out ownership of the site to all who take part in it. In this respect, Helen Verran and Michael Christie and colleagues seem to be *using* what Taussig refers to as the postcolonial, digital age's "mimetic excess." They are using both the technical and the cultural potential of post-coloniality (Taussig 1993, 255), exploiting the new technical and cultural diffuseness of representational borders, creating technical and cultural links backward and forward in time, changing the authorship and the performance of representation and facilitating a new techno-cultural active creation of past and future.

Such actions can also be seen, in different ways, in the concept of "galtha." As Verran narrates on the IKMRNA Web site, galtha is a ceremonial act, which occurs as part of aboriginal knowledge practices, which are world making (rather than world describing). If galtha is properly performed, it produces ancestral reality. In addition, a Yolngu person can embody an outstanding capacity to become his or her ancestral provenance at particular moments, becoming their own galtha and thereby having powerful agency (Verran and Christie 2007a, 15). Verran and Christie describe how they used particular software and design technologies to help make a Yolngu video-witness, in the form of a DVD that could be read as a galtha.

The DVD, described in part below, consisted of nineteen short videos filmed by a Liya-Dhälinymirr man, Mängay, and his friend John Greatorex, living near the Arafura Swamp in the Northern part of Australia. Each short video was filmed in a different place around the swamp. Verran describes the content of the video:

> In each place, while John filmed, Mängay spoke of its history, the ancestral journeys it features in, its location and complex patterns of Yolngu land ownership, and the varied responsibilities for and interests in that place invested

> in different groups of Yolngu people. Mängay exhorted and instructed, demonstrated, and explained. These short biographies of significant places were delivered in Mängay's Liya-Dhälinymirr language . . . . In subsequent filming Mängay's younger brother Yingiya, while listening to and watching the recording of his brother speaking in-place, translated the talk into English. In the DVD, we assembled for Mängay the second video of Yingiya speaking English appears as a small square set into the larger image of Mängay speaking Liya-Dhälinymirr. (Verran and Christie 2007a, 5).

Verran and Christie (2007a) see this DVD as Mängay exercising a form of agency for "producing, doing and enveloping place." The DVD is a thoroughly political postcolonial artifact belonging to a larger digital archive: it is made for viewing by English-speaking developers as well as Yolngu families and communities. Verran and Christie show that the DVD does much political, post-colonial work, much of which is uncomfortable even as it simultaneously enables aboriginal world making. The technology allows Yolngu viewers to watch the DVD with the English-speaking Yingiya's voice turned to silent: "the silent talking head of Yingiya effects an unspoken reminder of difference, and provides a commentary on the inadequacies of representational technologies designed for Western knowledge practices when used by Yolngu for Yolngu purposes" (Verran and Christie 2007a, 17).

The multiple layering of images, voices, languages, authors is what is immediately apparent through the DVD that forms part of the Yolngu archive. In this, Verran and Christie have unraveled and worked with the deep epistemological and ontological politics involved in making an aboriginal database. In this respect, their work has also inevitably involved a serious tinkering and reimagining of the conventional infrastructure of a database, specifically the Metadata, recognizing that it is often in the structure of the Metadata that cultural bias and embedded ontologies are obscured from view (Star 1999; Bowker 2000; Bowker and Star 1999). Christie comments:

> Western scientists tend to see their work as choosing the right language to describe the already structured world which they have discovered. To them, therefore the pre-emptive structure of metadata is productive—the data are organised in the way of the world. Thus databases are said to bear an ontology within them. Aboriginal scientists, on the other hand, whose work celebrates more the creative use of language to actively produce possible new worlds, (rather than simply reflect an immutable one) may be rather hampered by the structuration of metadata. The sorts of connectivities which can be given to a Yolngu word (it may be a place name, a person's name, a sacred object, a ceremonial procedure, or label for a totemic connection between groups) must

> not be prevented in the search process by the sequestering of metadata in particular fields (Christie 2004, 5).

In practical terms, this translates into making certain databasing practices primary: for example, making sure that the use of digital objects informs the logic of data structures, search engines, and interfaces (Christie 2004, 7).

The database that both Christie and Verran write about (Verran and Christie 2007a, b; Christie and Verran 2007) is the place where they "post" the reflections, insights, theories, observations, and desires that I have touched upon above. Using PDF linkages within the site, they represent their own thoughts and reflections as part of the database. Thus, part of the metadata is, in fact, a reflexive commentary, a "distributed witness" (IKMRNA 2004) on the construction of the database itself. Christie and Verran are concerned that the kinds of inscriptions that are made on the database must be, what Barthes called "Healthy signs"—representations that bear with the signs of their own partiality, constructedness, and historical location (Christie, n.d.).

Michael Christie, Helen Verran, and colleagues seem to have acted on a point made by Bowker: "Information technology, defined as we have as both the material base (for example, computers) and its idea machinery (for example computer programs) is a contingent historical locus at which scientific and social discourses meet and can share skills, insights and tools" (Bowker 2005, 136). What these scholars are doing, it would seem to me, are trying to make space for the generative within the archive, within the confines of "the database" that has historically been thought of as a container, but which they are transforming so that it becomes more like a site, a ceremonial ground where movement, difference, negotiation relating to knowledge can take place. In doing so, they are deliberately transforming and complicating the idea of the database as a technology of representation. They are opening up the border zone between database designers and database users to explore and make room for the potential role of ritual and myth around the database site. They are also recognizing the importance of infrastructure: their approach is to turn infrastructure inside out, turning it open to the play of the world and allowing it to be built from use, rather than from preconceived categories or even anticipation of use. Finally, they are building into the site a reflexive commentary that allows the outsider an insight into some of the deliberations, meetings, disagreements, and ways forward that shape the site and reveal why it is emerging in the way that it is on the Internet. At least some of the politics of the archive are exposed in this way.

Discussion

Research on the way that people order and archive their experiences of the world around them and the technologies they use to achieve this has historically been an important preoccupation within philosophy, anthropology, history, and the social sciences. This research has rarely focused solely on the technologies of ordering, however. It has always also been about the constructions of normative boundaries, values, and politics within societies (examples are Douglas 1966; Douglas and Hull 1992; Durkheim and Mauss 1970; Foucault 1992/1966; Levi-Strauss 1962).

STS, history of science, and anthropology have analyzed the technologies for ordering experience, memory, and data, often also examining and interpreting the wider, and sometimes shifting, cultural contexts in which they are situated (Agar 2003; Bowker and Star 1999, Bowker 2005, Douglas 1966, Barnes and Shapin 1986, Dean 1979). In this article, I have used the concept of the archive as an overarching and somewhat protean category to include the various forms these technologies take. My aim has been to convey how concepts of performance and emergence have infused our ways of thinking and have entwined themselves into many aspects of our natural and social orderings, as well as into the very technologies with which we order. It is perhaps not very surprising that the archive and our conceptualizations of how we might construct it in the future are beginning to reflect this wider culture in which performativity and generativity are acknowledged as key. I have suggested that archives (as diverse as a museum building, an inventory of species diversity, and a database for making place) are being created that materially and conceptually create the space for novel kinds of performance, emergence, and generativity, which themselves entail new configurations between public and experts, new concepts of the relationship between human, technological, and biological entities, and a new sensitivity toward the ontologies and histories of the different players who together take part in the ongoing making of the archive.

As I suggested in the introduction, interpretation of what is at stake here seems to lead in two directions. The first is a route along which we accept that we exist in a world of flux, recursivity, multiple causalities, and interpretation. In terms of aboriginal philosophy, in terms also of the underlying philosophy of most biologists, and in terms of our own reflexive user-understandings of the archive, this is an active, on-going, emergent, coproductive, and open-ended state of affairs. It may mean different things for different communities. For the community of archivists, it is ''the imperative of challenging Absolutes'' in the post-modern age. For Verran, this is

databasing as way of doing collective memory where "collective memory" is "people in place going on together" (Verran 2005). For David Turnbull (2003, 2007), this is a commitment to aligning and respecting incommensurabilities in human knowledges of the world. Within this "ontology of emergence" (for short), the notion of the archive as an ark, a place set apart in which to entrust carefully selected data for the future has an outdated and problematic connotation.

A second interpretation takes us into an altogether different ontological space, one in which we are ill-equipped to live in a way that is chronically open to flux, revision, emergence, and flow. If we go down this route, as well as feeling a nervousness and excitement to the meaning of these archival experiments, we feel we are witnessing a step into a somewhat unknown world (Rabinow 1999; Haraway 1997; Hayles 2005; MacKenzie 2002), and we may also be tempted to pull back the meaning of the experiments into a more knowable, static, less chronically open-ended understanding of how data and archives serve human needs and expectations.

It seems to me that it is hard for any of us (even including radical constructivists and Yolngu elders) to fully be in either one of these purified camps—the one performative and emergent, the other static and representational. Our technoculture is one in which both ontologies, despite their seeming imperviousness one to the other, coexist in dependence of one another. And so, for the following reasons, I would be cautious of describing the ideas and the practices of the archives I have described as either wholly novel or pure in their performative and generative endeavors.

First, in STS we can say with confidence that we have never had nonperformative, nongenerative archives.[9] As STS has found, many of the performative and generative effects of what we might call the new emergent archives were already implicitly understood in conventional archives. A biologist's tacit understanding of a species database, for example, is sophisticated enough to allow for an understanding of emergence and change (Ridley 2003, 377; Laurence and Margulis 1999, 11). Species naming, to give another example, has been shown to be highly performative, ritualized, and delicate cultural endeavor, certainly not a crude and static labeling exercise (Bowker 2005). Museum spaces, in the past, to give a further example, were not nearly as highly segregated between research and public spaces as they have tended to become in recent years. Databases and classifications have always mirrored and to an extent re-performed the knowledge economies of which they are a part (be it empire, nation, multicultural society) and enrolled imagined public into that performance (Richards 1993; Schiebinger 1993; Ritvo 1997; Bowker and Star 1999).

Second, just as the new archives of performance and emergence reveal new things in making transparent their orderings, they conceal or obscure others. Verran, Christie, and their colleagues are acutely aware of this, pointing to the ways in which the new IKMRNA database fails to adequately represent important human and technical facilitators of that database; showing how by using video archives, other novel performances may be stifled; showing the way in which the database may "work" for one cultural grouping (Yolngu) yet fail to reveal anything salient for another cultural group (Australian developers; Verran and Christie 2007a). Thinking back to the Darwin Centre in the NHM, there are many questions. Does the new drive to transparency and accessibility really open up this great archive of natural history to "the public"? Although transparent, what modes of conceptual ordering, discipline, and organization remain invisible and therefore unquestioned by the newly enfranchised public visitor to the Darwin Centre? Does "Darwin Centre Phase One" dilute, neutralize, or even just "hide" in novel ways a set of past powers and inner hierarchies that were once deemed necessary for the ordering of the natural/social world? What new polity (e.g., regarding the biosciences, or "biodiversity") is the Darwin Centre acting for/within, and how are we as public visitors invisibly implicated in these relationships? Is the transparency of the Darwin Centre Phase One an illusion, maybe even a confusion?

Given these points, what ought STS to aim for in its reading, interpretation, and experimental construction of databases and archives? I suggest here that we need to continue to make the effort to understand the *implicit* performative and generative aspects, even of seemingly "dead" archives—the kinds of environmental databases that policy makers create and use (Bowker 2000; Waterton 2002); the static-looking species databases that may actually be generative of new meanings; the "boring" infrastructure of existing classifications (Star 1999); and of course, the ex-colonial edifices and archives that maintain extractive relationships to the world's bio and cultural diversity.

STS scholars, it seems, are now not only analyzing archival material artifacts like databases but also helping construct them afresh. They have taken up the challenge of understanding themselves and the technologies they are making as part of a much larger ongoing and reflexive techno-political performance within the world. What STS scholars know and accept is the impossibility of withdrawing from the frame for the purpose of understanding our own culture and its artifacts. Yet to attempt to understand such artifacts, and to take an active and reflexive part in their making, seems a very valuable contribution. STS is being ambitious here: it is making room for critical interventions in a generative world. This is an important step, but

one that should be deliberately complicated—not only by interpretation of the new reflexive, generative archives, but of the "old" "dead" databases that implicitly harbor all the politics, choices, performativity, and generativity of those that are new.

Notes

1. This study does not attempt to think through the interesting question of how it is that developments in one area of knowledge (e.g., social theory) permeate through to other seemingly unrelated spheres (e.g., database design).
2. A number of publications around that time contributed to a rethinking of the intellectual place of the archive, for example, Cook 2001; Cook and Swartz 2002; Cook and Dodds (2003); Nesmith 2002; Ketelaar 2001, 2002; Hamilton et al. 2002.
3. Databases, classifications, and inventories of nature I have studied include CORINE, EEIONET, the National Vegetation Classification, the European Vegetation Survey, the UK's National Biodiversity Network. Current research is looking at the construction of a database for the inventorying of species "barcodes" —the Barcoding of Life Database or BOLD.
4. Cook and Schwartz (2002) interpret a range of contemporary archival practices as "transgressive performances" in their collection of articles devoted to the theme "Archives, Records and Power" (Archival Science Volumes 1.2 and 2.0).
5. Agar 2003; Bowker 2005; Bowker and Star 1999, Berg 1997, Hine 2003, 2006, Derrida 1998/1995.
6. This example derives from observations made by the author during research carried out at the NHM, London from 2002 to the present.
7. Those listed on Verran and Christie (2007a) are Trevor van Weeren, Bryce Anbins-King, Mangay Guyula, Yingiya Guyula, and John Greatorex.
8. Christie 2004.
9. Or to put it another way perhaps, "we have never been modern" (Latour 1993).

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References

Agar, J. 2003. The government machine: A revolutionary history of the computer. Strategies Supporting Heterogeneous Data and Interdisciplinary Collaboration: Towards an Ocean Informatics Environment. Proceedings of the 38th Annual Hawaii International Cambridge. Massachusetts: MIT Press.

Agrawal, A. 1995. Dismantling the divide between indigenous and scientific knowledge. *Development and Change* 26 (3):413-439.

Austin, J. L. 1962. *How to do things with words*. Oxford: Clarendon Press.

Baker, K. S., J. J. Steven, R. Jerome, and J. R. Wanetick. 2005. Conference on System Sciences (HICSS'05)—Track 8, 219.

Baker, K., and K. Stocks. 2007. Building environmental information systems myths and interdisciplinary lessons. Proceedings of the 40th Hawaii International Conference on System Sciences, 253b.

Barad, K. 1998. Agential Realism Feminist Interventions in Understadning Scientific Practices. In *The science studies reader*, ed. M. Biagioli, 1-11. New York: Routledge.

———. 2003. Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter. *Signs: Journal of Women in Culture and Society* 28 (3):801-31.

Barnes, B., and S. Shapin, eds. 1986. *Natural order: Historical studies of scientific culture*. Beverly Hills, CA: SAGE.

Beaulieu, A. 2004. From brainbank to database: the informational turn in the study of the brain. *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* 35 (2):367-90.

Bell, V., ed. 1999. *Performativity and belonging*. London: SAGE/TCS.

Berg, M. 1997. *Rationalizing medical work. Decision-support techniques and medical practices*. Cambridge, MA: MIT Press.

Boast, R., M. Bravo, and R. Srinivasan. 2007. Return to Babel: Emergent diversity digital resources, and local knowledge. *The Information Society* 23 (5):395-403.

Bonifacio, M., P. Bouquet, and P. Traverso. 2002. Enabling distributed knowledge management: Managerial and technological implications. *Upgrade* 18 (1):24-30.

Bowker, G. 2000. Biodiversity Data-diversity. *Social Studies of Science* 30 (5): 643-83.

———. 2005. *Memory practices in the sciences*. London and Cambridge, Massachusetts: MIT Press.

Bowker, G., and S. L. Star. 1999. *Sorting things out: Classification and its consequences*. Cambridge, Massachusetts: The MIT Press.

Butler, J. 1990. *Gender trouble*. New York: Routledge.

———. 1993. *Bodies that matter: On the discursive limits of "Sex"*. New York: Routledge.

———. 1997. *Excitable speech: A politics of performativity*. New York: Routledge.

Carlson, M. 1996. *Performencae: A critical introduction*. London: Routledge.

Christie, M. 2004. Computer databases and aboriginal knowledge' *Learning Communities: International Journal of Learning in Social Contexts* 1(February):4-12.

Christie, M. n.d. Aboriginal knowledge on the Internet. Paper presented at the Batchelor Institute, *Researching our Practice*, SAIKS, CDU. http://www.cdu.edu.au/centres/ik/pdf/AbKnowInternet.pdf (accessed September 25, 2008).

Christie, M., and H. Verran. 2007. Using digital technologies in doing Indigenous places in Australia. www2.unil.ch/easst2006/Papers/C/Christie_Verran.pdf (accessed May 2007).

Clark, N. 2003. The Play of the World. In *Using social theory thinking through research*, ed. M. Pryke, G. Rose and S. Whatmore, 28-46. London: SAGE Publications in association with the Open University.

Clifford, J. 1997. Museums as contact zones. In *Routes: Travel and translation in the late twentieth century*, ed. J. Clifford, 188-219. Cambridge: Harvard University Press.

———. 2004. Histories of the Tribal and the Modern. In *Grasping the world: The idea of the museum*, ed. D. Preziosi and C. Farago. Aldershot: Ashgate Publishing.

Cook, T. 2001. Fashionable nonsense or professional rebirth postmodernism and the practice of archives. *Archivaria* 51(Spring):14-35.

Cook, T., and G. Dodds, eds. 2003. *Imagining archives: Essays and reflections by Hugh Taylor*. Lanham, Maryland: Scarecrow Press, Association of Canadian Archivists, and Society of American Archivists.

Cook, T., and J. M. Schwartz. 2002. Archives, records, and power: From (Postmodern) theory to (archival) performance. *Archival Science* 2 (3-4):171-85.

Dean, J. 1979. Controversy over classification: A case study from the history of botany. In *Natural order: Historical studies of scientific culture*, ed. B. Barnes and S. Shapin 211-30. Beverly Hills: SAGE.

Deleuze, G. 1994/1968. *Difference and repetition*. London: Athlone Press.

Deleuze, G., and F. Guattari. 1987/1980. *A thousand plateaus: Capitalism and schizophrenia*. Minneapolis, Minnesota: University of Minnesota Press.

Derrida, J. 1995. *Archive Fever: A Freudian Impression*. Chicago: University of Chicago Press. Page references are to the 1998 paperback edition.

Dewsbury, J.-D. 2000. Performativity and the event: Enacting a philosophy of difference. *Envjronment and Planning D: Society and Space* 18 (4):473-96.

Douglas, M. 1966. *Purity and danger—An analysis of concepts of pollution and taboo*. London: Penguin Books.

Douglas, M., and D. Hull, eds. 1992. *How classifications work: Nelson Goodman among the social sciences*. Edinburgh: University of Edinburgh Press.

Durkheim, E., and M. Mauss. 1970. *Primitive classification*. London: Cohen and West. 2nd edition, trans. from the French by Rodney Needham, originally published as 'De Quelques Formes Primitives de Classification' in *Année Sociologique'* (1903), 89-93.

Foucault, M. 1992/1966. *The order of things: An archaeology of the human sciences*. London: Routledge. Originally published in French as *Les Mots et les Choses* (Editions Gallimard 1966).

Friedman, B., and H. Nissenbaum. 1996. Bias in computer systems. *ACM Transactions on Information Systems* 14 (3):330-47.

Grosz, E. 1995. *Space, time and perversion*. London: Routledge.

———. 1999. Darwin and feminism: Preliminary investigations of a possible alliance. *Australian Feminist Studie* 14 (29):31-45.

Hamilton, C., V. Harris, J. Taylor, M. Pickover, G. Reid, and R. Saleh., eds. 2002. *Refiguring the archive*. Cape Town: David Philip.

Haraway, D. 1997. *Modest Witness@Second Millennium.FemaleMan©_Meets_OncoMOuse™*. London: Routledge.

Haraway, D. 1988. Situated knowledges the science question in feminism as a site of discourse on the priviledge of a partial perspective. *Feminist Studies* 14 (3):575-99.

Hayles, N. K. 2005. *My mother was a computer: Digital subjects and literary texts*. Chicago: University of Chicago Press.

Hine, C. 2003. Systematics as Cyber science: The role of ICTs in the working practices of taxonomy. Paper presented at Oxford Internet Institute Information, Communication and Society Symposium, 17-20 September 2003, University of Oxford, UK.

Hine, C., ed. 2006. *New infrastructure for knowledge production: Understanding e-science*. London: Information Science Publishing.

Huyssen, A. 1995. *Twighlight memories: Marking time in a culture of amnesia*, London: Routledge.

IKMRNA. 2004. The IKMRNA Web site. TAMI—A database and file management system for indigenous use. http://www.cdu.edu.au/centres/ik/db_TAMI.html

Introna, L., and H. Nissenbaum. 2000. Shaping the Web: Why the politics of search engines matter. *The Information Society* 16 (3):1-17.

Jensen, C. B. 2005. An experiment in performative history: Electronic patient records as a future generating device. *Social Studies of Science* 35 (2): 241-67.

Kaplan, E. 2002. 'Many paths to partial truths': Archives, anthropology, and the power of representation. *Archival Science* 2 (3-4):209-20.

Kearnes, M. B. 2003. Geographies that matter—The rhetorical deployment of physicality? *Social and Cultural Geography* 4 (2):139-52.

Ketelaar, E. 2001. Tacit narratives the meanings of archives. *Archival Science* 1.2: 131-41.

———. 2002. Archival temples, archival prisons: Modes of power and protection. *Archival Science* 2 (3-4):221-38.

Latour, B. 1993. *We have never been modern*. Cambridge, Massachusetts: Harvard University Press.

Laurence, S., and E. Margulis. 1999. *Concepts: Core readings*. Cambridge, Massachusetts: MIT Press.

Levi-Strauss, C. 1962. *La pensée sauvage*. Paris: Presses Universitaires De France. (English edition: Levi-Strauss, C. 1966.*The Savage Mind*. London: Weidenfeld & Nicolson).

Lorrimer, H., and K. Lund. 2003. Performing facts: Finding a way over Scotland's mountains. In *Nature performed environment, culture and performance*, ed. B. Szerszynski, W. Heim and C. Waterton, 130-144. Oxford: Blackwell/The Sociological Review.

Macdonald, S., and Fyffe, G., eds. 1998. *Theorizing museums*. Oxford: Blackwell Publishers/The Sociological Review.

MacKenzie, A. 2002. *Transductions: Bodies and machines at Speed*. London: Continuum Books.

Massey, D. 2003. Imagining the field. In *Using social theory thinking through research*, ed. M. Pryke, G. Rose and S. Whatmore, 71-88. London: SAGE Publications in association with the Open University.

Maturano, A. 2003. Molecular biologists as hackers of human data: Re-thinking IRP for bioinformatics research. *Journal of Information, Communication and Ethics in Society* 1 (4):207-16.

Maturano, A., and R. Chadwick. 2004. How the role of computing is driving new genetics' public policy. *Ethics and Information Technology* 6 (1):43-53.

Natural History Museum Annual Report. 2001/2002. London: Natural History Museum.

Natural History Museum. 2003. The 2003−2007 Corporate Plan. London: Natural History Museum.

Nesmith, T. 2002. Seeing archives: Postmodernism and the changing intellectual place of archives. *American Archivist* 65 (1):24-41.

NHM/BBC Wildlife. 2002. Nature's Treasures Darwin Centre at the Natural History Museum, *NHM and BBC Wildlife Magazine*, 1-35.

Outram, D. 1996. New Spaces in Natural History. In *Cultures of natural history*, ed. N. Jardine, J. Secord and E. Spary, 249-65. Cambridge: Cambridge University Press.

Pfaffenberger, B. 1992. Technological dramas. *Science, Technology, & Human Values* 17 (3):282-312.

Preziosi, D., and C. Farago, eds. 2004. *Grasping the world: The idea of the Museum*. Aldershot: Ashgate Publishing.

Rabinow, P. 1999. *French DNA: Trouble in purgatory*. Chicago: University of Chicago Press.

Ratto, M. 2006. Foundations and profiles: Splicing metaphors in genetic databases and biobanks. *Public Understanding of Science* 15 (1):31-5.

Ribes, D., K. Baker, F. Millerand, and G. Bowker. 2005. Comparative interoperability porject configurations of community, technology and organization. *Proceedings of the 5th ACM/IEEE-CS Joint Conference on Digital Libraries*, 65-6.

Richards, T. 1993. *The imperial archive: Knowledge and the fantasy of empire*, London: Verso.

Ridley, M. 2003. *Evolution*. 3rd ed. Oxford: Blackwell Publishers.

Ritvo, H. 1997. *The platypus and the mermaid, and other figments of the classifying imagination*. Cambridge, Masschusetts: Harvard University Press.

Schiebinger, L. 1993. *Nature's body: Gender in the making of modern science*. Boston, Masschusetts: Beacon Press.

Srinivasan, R., and J. Huang. 2005. Fluid ontologies for digital museums. *International Journal of Digital Libraries* 5 (3):193-204.

Star, S. L. 1999. The ethnography of infrastructure. *American Behavioral Scientist* 43 (3):377-91.

Stengers, I. 1997. *Power and invention: Situating science*. Minneapolis: University of Minnesota Press.

Szerszynski, B., W. Heim, and C. Waterton. 2003. *Nature performed: Environment, culture and performance*. Oxford: Blackwell Press/the Sociological Review.

Taussig, M. 1993. *Mimesis and alterity: A particular history of the senses*. London: Routledge.

Thrift, N., and J. D. Dewsbury. 2000. Dead geographies—And how to make them live. *Environment and Planning D: Society and Space* 18 (4):411-32.

Turnbull, D. 2003. *Assemblages and diversity: Working with incomensurability: Emergent knowledge, narrativity, performativity, mobility and synergy.* Paper Presented at AHHPSSS, Melbourne, 2003.

Turnbull, D. 2007. Maps narratives and trails: Performativity, hodology, distributed knowledge in complex adaptive systems—An approach to emergent mapping. *Geographical Research* 45 (2):140-45.

Verran, H. 2005. Knowledge traditions of aboriginal Australians: Questions and answers arising in a databasing project. Draft published by making collective memory with computers, school of Australian indigenous knowledge systems, Charles Darwin University, Darwin, NT 0909, Australia, at http://www.cdu.edu.au/centres/ik/pdf/knowledgeanddatabasing.pdf (accessed September 25, 2008).

Verran, H., and M. Christie. 2007a. 'Using/Designing Digital technologies of Representation in Aboriginal Australian Knowledge Pactices of Place'. Running Title: 'Digital technologies and Aboriginal Knowledge Practices'. Draft on IKMRNA website, accessed May 2007. http://www.cdu.edu.au/centres/ik/pdf/DigTech_IndigPlaceAust.pdf

Verran, H., and M. Christie. 2007b. 'Using Digital technologies in Doing Indigenous Places in Australia'. Paper on IKMRNA website, accessed May 2007. http://www2.unil.ch/easst2006/Papers/C/Christie_Verran.pdf

Waterton, C. 2002. From field to fantasy: Classifying nature, constructing Europe. *Social Studies of Science* 32 (2):177-204.

Williams, R. 1976. *Keywords: A vocabulary of culture and society*. London: Croom Helm.

Witcomb, A. 2003. *Re-imagining the museum: Beyond the mausoleum*. London: Routledge.

Wouters, P., and A. Beaulieu. 2006. Imagining e-science beyond computation. In *New Infrastructure for Knowledge Production: Understanding e-Science*, ed. C. Hine, 48-70. London: Information Science Publishing.

Yunupingu, M. 1994a. Yothu Yindi—Finding balance. In *Voices from the Land*, ed. M. Yunupingu and Australian Broadcasting Corporation, 1-11. Sydney: ABC Books.

Yunupingu, M. 1994b. Yothu Yindi: Finding balance. *Race and Class* 35 (4):113-20.

Bio

Claire Waterton, PhD, is Senior Lecturer and Director of the Center for the Study of Environmental Change in the Department of Sociology, Lancaster University, UK. Her research is on the cultural politics and making of environmental knowledge.