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Ecological Media Studies and the Matter of Digital Technologies

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IN 2009 WILLIAM PANNAPACKER PRONOUNCED THE DIGITAL HUMANITIES TO BE "THE FIRST 'NEXT BIG THING' IN A LONG TIME" PROMISING to reconfigure and reinvigorate the humanities. The same could now plausibly be said about the environmental humanities with the recent rise of dedicated academic centers (at, e.g., KTH Royal Institute of Technology, in Sweden; Princeton University; the University of California, Santa Barbara; and the University of Utah), grant-funded projects (like the Sawyer Seminar on the Environmental Humanities at the University of California, Los Angeles, and the consortium Humanities for the Environment), and faculty positions. If the digital and environmental humanities have been ascendant amid what Christopher Newfield describes as the "unmaking" of public higher education and what Richard Grusin terms the "crisis humanities," such an assessment invites the question of whether the ecological digital humanities (EcoDH) might serve to combine the most saleable facets of the digital humanities and the environmental humanities for university stakeholders who promote applied humanities work outside academia or, alternatively, a hybrid method for researching, teaching, and designing cultural responses to structures of ecological and social precarity (Grusin 80).

While these potential futures of EcoDH could unfold simultaneously, I aim in what follows to pave the way for this hybrid method, by offering a supplemental framework for connecting the environmental and digital humanities, which this essay terms ecological media studies. A prompt for academic inquiry as well as collaboration outside academia, this framework combines scholarly attentiveness to the material ecologies of new media and digital computing with the participatory, playful media practices at work in twenty-first-century environmental art and activism. The new materialist provocation to understand all bodies—human, animal, plant, mineral, microbial, machine, and inanimate—in their material and semantic lives and in their networked and individuated phases informs my conceptualization of ecological media studies by suggesting that the

ubiquity of ecological metaphors for the digital (from data mining to media ecology itself) obscures the matter of digital technologies.

The Ecological Digital Humanities: Genealogies and Horizons

In a 2004 primer, Greg Garrard defines ecocriticism capaciously as the literary and cultural study of ecological problems wherein rhetorical analysis is central. Garrard observes that the organizing premise of such an endeavor is the notion that "environmental problems require analysis in cultural as well as scientific terms, because they are the outcome of an interaction between ecological knowledge of nature and its cultural inflection," or, more aptly, inflections (14). In step with Lawrence Buell and Ursula K. Heise,[1] Garrard traces the history of ecocriticism from an initial focus on nature writing, wilderness rhetoric, and local place-based identities to widening concerns with environmental justice, urban ecologies, other-than-human bodies, and the environmental consequences of colonialism and globalization. Ecocriticism by this measure has become a "convenient shorthand," as Heise puts it, for variegated approaches that fall under the headings of "environmental criticism, literary-environmental studies, literary ecology, literary environmentalism, and green cultural studies"—a catalog to which we could add theoretically and politically inflected fields such as postcolonial ecologies, environmental justice cultural studies, and material ecocriticism ("Hitchhiker's Guide" 506).[2] As ecocriticism has become more multiform over the last decade, so too have ecocritics resituated their work within the environmental humanities, defined to include literature, media studies, science studies, philosophy, history, art history, cultural geography, and anthropology (not to mention the digital humanities). However multidisciplinary, the environmental humanities arguably cohere in how they depart

from what Buell terms first-wave ecocriticism ("Ecocriticism"). Namely, environmental humanities projects are expanding the parameters of environmental culture by addressing not only literary texts but also visual art, performance, new media, activist ephemera, popular science, ethnographies, and scientific models; by imagining nature to include cities, food systems, diasporas, indigenous cosmologies, and global energy networks along with wilderness sites and rural locales; and by developing critical theories of the environment.

Two publications illustrate these intellectual trends and open onto the question of what imperatives and ideas are shaping (or might shape) EcoDH. The first is a 2009 *Critical Inquiry* essay that has become required reading in the environmental humanities: the postcolonial historian Dipesh Chakrabarty's "The Climate of History." Organized around four theses, the essay posits that the science of anthropogenic climate change—which shows that with industrialization humans become geological agents and which accordingly suggests an epochal shift from the Holocene to what has been provisionally termed the Anthropocene—requires a new historiographic practice. Such a practice, Chakrabarty contends, should start by jettisoning "the age-old humanist distinction between natural history and human history" (201). While critics of Anthropocene discourse have cautioned against its tendency toward a universalism that elides the unequally shared causes and consequences of climate change, Chakrabarty mostly avoids this pitfall in arguing that environmental history—and by extension the environmental humanities—best responds to climate change by bringing "together intellectual formations that are somewhat in tension with each other: the planetary and the global; deep and recorded histories; species thinking and critiques of capital" (213). This idea has particular implications for EcoDH. If we follow Chakrabarty's argument, a field sited at the convergence of ecological problems and

digital humanities methods should strive to interlace the timescales of "deep and recorded histories" with the compressed temporality of the digital (as in the real-time cadence of rapid prototyping, database querying, and media streaming) and to recognize not only the bodies of species and institutions of capital but also the virtual networks that connect, track, and animate both.

The second publication with insights for EcoDH is *Bodily Natures*, by the feminist science studies scholar Stacy Alaimo, who has been at the forefront of the material turn. Like the collections *Material Feminism* (which she coedited) and *Material Ecocriticism* (to which she contributed an essay), *Bodily Natures* takes nature seriously in its concrete multiplicities—presenting Alaimo's research on the science and culture of X-rays, toxic chemicals, deep-sea creatures, and plastic compounds. In doing so, it contests tendencies in poststructuralism, posthumanism, and certain strands of ecocriticism to abstract nature from its material and historical instantiations. To guide her research, Alaimo develops a theory of transcorporeality, a theory rooted in the idea that "the material self cannot be disentangled from networks that are simultaneously economic, political, cultural, scientific, and *substantial*" and in the corollary notion that the "material environment is a realm of often incalculable, interconnected agencies" (20–21; emphasis mine).

Putting Chakrabarty's scale-shifting historiography into dialogue with Alaimo's materialist feminism offers another possible direction to early adopters of EcoDH (whether or not they would identify with the label)—from the Humanities for the Environment–sponsored *Life Overlooked*, an archive that contains multimedia narratives of flora, fauna, and other bodies inhabiting the crevices of local places, to the interactive *Naturehoods*, a database of parks and other green spaces in three dozen cities in the United States that Stanford University hosts and

that employs spatial mapping as well as text-mining methods. Scholars like Chakrabarty and Alaimo suggest the importance of historicizing and materializing the digital technologies that constitute the research apparatus of such EcoDH projects by mapping those technologies onto timescales slower than the real-time "interval" of "versions, updates, and . . . half-lives" and by apprehending them within material networks composed of biological and engineered bodies (Raley 39).

The Digital Humanities: From Computational Techniques to Material Conditions

I will return to Chakrabarty's and Alaimo's principles below in pivoting from EcoDH to ecological media studies. As a bridge, I turn now to recent calls for the digital humanities writ large to examine and intervene in the material social conditions of network society and digital infrastructure. In dialogue with other scholars, N. Katherine Hayles locates the origins of the digital humanities in decades-old humanities computing efforts to digitally preserve and parse text archives. These efforts laid the groundwork for the digital humanities to organize initially around "machine reading" techniques of encoding, mining, and analyzing lexical and generic patterns in large corpora of texts. Taking stock of the present, Hayles contends that the digital humanities are "morphing" as researchers "advocate a turn from a primary focus on text encoding, analysis, and searching to multimedia practices that explore the fusion of text-based humanities with film, sound, animation, graphics, and other multimodal practices" (25). Gary Hall reinforces this claim, noting that the digital humanities now encompass "interactive information visualization, science visualization, image processing, geospatial representation, statistical data analysis, network analysis, and the mining, aggregation, management, and manipulation of data" (781).

Such appraisals dovetail with Alan Liu's 2013 blog post on the thorny question of whether the term *digital humanities* should be singular or plural. While Liu acknowledges that when treated as singular the term names a coherent field, he suggests that the digital humanities would do well to retain a plural sense of self by "engag[ing] in much fuller conversation with their affiliated or enveloping disciplinary fields (e.g., literary studies, history, writing programs, library studies, etc.), cousin fields (e.g., new media studies), and the wider public about where they fit in, which is to say, how they contribute to a larger, shared agenda expressed in the conjunction and collision of many fields" ("Is"). Liu echoes recent critiques of the digital humanities (including his own) that query the growing professional divide between the production of computational algorithms, databases, and tools and the cultural study of digital media (Grusin; Hall; Hayles; Liu, "Where"; Raley). These analyses of such a divide encourage a détente between praxis and criticism and between the digital humanities and the so-called interpretive humanities.

Holding up Franco Moretti's distant reading methodology for its capacity to pose cultural and sociological questions of large text corpora, Liu envisions digital humanities approaches that integrate "text analysis and cultural analysis" ("Where"). Namely, he advocates for cultural analysis of the "instrumentality" paradigm that shapes knowledge work in the information age, including the knowledge work of the digital humanities. Elaborating on this idea, Rita Raley argues that the digital humanities have proved "particularly useful" (or instrumental, as Liu puts it) "in our current mercantile knowledge regime, with its rational calculus of academic value" (32). She identifies a pressing need for "more critical reflection upon, and ironic self-awareness about, the embedded place of digital humanities in the contemporary knowledge economy" (34). For Grusin, this

project is vital, given that "the institutional structure of digital humanities threatens to intensify . . . the proliferation of temporary insecure labor that is rampant not only in the academy but throughout twenty-first-century capitalism" (82). In enumerating the forms that "critical reflection" might take for the digital humanities, Raley looks to the "self-reflexivity about situatedness" in cultural studies and the "playful interventions" of new media art practices that she has classed under the heading of tactical media (35, 40). Referring to exempla like the independent network WiFi.Bedouin, Raley writes, "Tactics are designed to produce open-ended questions rather than definitive answers, to lead to new discovery rather than diagnostic evaluation, such that the researcher remains continually aware of the mechanics of knowledge production and attuned to the possibilities of alternative techniques, frames, and paradigms" (39). This mode of tactical critique and countercultural engineering, Raley suggests, could powerfully retool the digital humanities.

Ecological Media Studies: Projects and Prototypes

The environmental humanities have a potentially unique contribution to make to such tactical digital humanities by delving into what we could term, building on Raley's formulation, the ecological materiality of digital "knowledge production" and by collaborating on "techniques, frames, and paradigms" that model alternative labor conditions and alternative environmental ethics to those of late capitalism. I contend that ecological media studies offers a nimble rubric for doing just that. My thesis builds on the arguments that Hayles, Raley, Tara McPherson, Patrick Jagoda, Wendy H. K. Chun, and others have made for linking the digital humanities, media studies, and multimodal media practices and thereby generating more robust methods

and theories by which the "materiality in media" may be understood (Hayles 7).

Hayles teases this trope out on grounds that are especially resonant with ecological media studies. Her work provides conceptually rich histories of the embodied forms that digital technologies assume in literary narratives, visual media, scientific research, engineered machines, and human-computer interfaces. Her latest thinking along these lines swerves toward new materialism and, if tacitly, the environmental humanities. In *How We Think*, she writes that to "gras[p] the complex ways in which the time scales of human cognition interact with those of intelligent machines requires a theoretical framework in which objects are seen not as static entities that, once created, remain the same throughout time but rather are understood as constantly changing assemblages" (13). This argument chimes with Alaimo's concept of transcorporeality while calling to mind Jane Bennett's description of assemblages in *Vibrant Matter*. This sense of computing technologies as bodies embedded in material networks informs Hayles's related points about the geospatial materiality of digital production. "If time is deeply involved with the productions of digital media, so too is space," Hayles writes, explaining that "GIS (geographic information system) mapping, GPS (global positioning system) technologies, and their connections with networked and programmable machines have created a culture of spatial exploration in digital media" (14). Hayles's arguments show that we think the digital not just through virtual programs and distributed networks but also through the extended, embodied "cognition" that human-computer interactions germinate and, critically, through the "larger networks that extend beyond" devices and users "into the environment" (3).

EcoDH qua ecological media studies can flesh out these principles by addressing the nonhuman and nonmachine bodies of flora, fauna, rare earth minerals, earth and sea undergrounds, regional watersheds, and globally networked energy fields that constitute both the environments and infrastructures of the digital. Situated at the crossroads of the environmental humanities and media studies, a number of projects have recently begun to model this undertaking. Notable examples include Sue Thomas's exploration of "technobiophilia"; the essay collection *Ecomedia* and its companion blog (Rust, Monani, and Cubitt); Heise's account of "unnatural" ecological metaphors in media ecology ("Unnatural Ecologies"); Richard Maxwell and Toby Miller's environmental history of old and new media and accompanying criteria for green media practices; Stephanie LeMenager's inclusion of print and digital media in the "petroleum archive" she builds for her book *Living Oil*; Nicole Starosielski's accounts of the media heat and undersea cables that help to power the Internet ("Materiality"); Heather Houser's contemplation of how data visualization and information management tools operate across contemporary environmental media to disseminate "data sets that are too large, complicated, inaccessible, or tedious for [individuals] to comprehend" (319); an online storytelling platform about foraging ecosystems, cultures, and economies, known as *Matsutake Worlds Live*; and, finally, the open-source app *Curatescape*, designed to enable communities to exhibit site-specific histories (Tebeau and Cleveland State Univ.).

As this range of examples indicates, the emerging field of EcoDH, which I am further delineating as ecological media studies, runs the gamut from peer-reviewed scholarship that draws on archival research, hermeneutics, and cultural history to experimental research that blends fieldwork, media aesthetics, and creative nonfiction to self-published sites that aggregate multimedia narratives with geolocated data. The projects share the investments identified above as constitutive of ecological media studies. That is, each endeav-

ors to provide material histories and theories of digital technologies and—whether through traditional scholarship, public projects, or both—to make visible the ecological as well as the sociocultural circumstances of networks.

I hope that in the future ecological media studies—now a somewhat aspirational field—will continue to bring further coherence to these multipronged efforts. Here, Starosielski's research on Internet infrastructure (defined to encompass the mined metals, cellular towers, satellites, cables, servers, data centers, and networked devices that coproduce digital networks) provides an exciting prototype. Starosielski was arguably the first media studies scholar to develop an eco-centric approach to the materiality of digital media and networks. The approach informs her research on the undersea cables that disturb coastlines around the world ("Beaches," "'Warning,'" and "Critical Nodes"). So too does it inflect her short history of the evolving hot-and-cold registers for different media ("Materiality"). That account ends with a reflection on data centers and suggests that material as well as rhetorical links now exist between the Internet and global climate change: "Data centers and computer systems generate enormous amounts of heat, which in turn form one of the greatest threats to communications systems. . . . An attention to the generation and redistribution of this heat connects media to the energy infrastructures on which they depend and, in turn, to the intensification of global warming" ("Materiality" 2505). As Starosielski concludes, this attention to virtual-biophysical exchanges (like the heat exchanges that attend the flow of data through networks) "help[s] us to better understand how media both enfolds and gives rise to a set of broader environmental relations and conditions for life" (2506). Her conclusion here dovetails with my own analysis of "the digital cloud" (or the Internet in the era of apps, social media, mobile computing, cloud storage platforms, and the estimated

ten billion network connections worldwide). Observing that "the cloud's apparent ubiquity makes it difficult to assume an outside, critical perspective on its infrastructure," I have elsewhere identified a lack of attention in environmental and media studies to the concrete materials, and material consequences, of the Internet's growing footprint (343). Such inquiries underscore that it would be fruitful for ecological media studies to cultivate "an ecological ethic for storing, accessing, and sharing data that takes into account forms of digital power and disempowerment" (353). In 1967 Marshall McLuhan and Quentin Fiore asserted that in the information age any "understanding of social and cultural change is impossible without a knowledge of the way media work *as environments*" (26). While their assertion relegated biophysical environments to the rhetorical status of metaphor (ironically, just as environmentalism was coming to life as a social movement), ecological media studies might return ecology to a literal register by taking up the matter of digital technologies and the ecology of media.

Coda: Ecological Media Praxis

The intellectual contexts for ecological media studies posited above suggest how blurry the boundaries are becoming between the digital humanities and media studies. These blurred boundaries stem partly from cultural work outside academia—including do-it-yourself maker culture, citizen science, new media art, tactical media, and hacktivism—that does not separate practice from theory, engineering from critique.

The existing projects we might tag as EcoDH have often taken cues from and, in some cases, joined these communities of practice beyond the university. The Humanities for the Environment stands out on this score. An international Mellon-funded consortium of humanities centers, it has involved an array of collaborators, including

historians, ecocritics, bioethicists, environmental justice scholars and activists, forest ecologists, creative writers, artists, and urban designers. One project in which public engagement and collaborative environmental media praxis coalesced was Dinner 2040, organized by the Arizona State University team in the Western Observatory of the Humanities for the Environment. Dinner 2040 adapted a design process used in architecture and urban planning known as charrette to convene local and visiting academics as well as artists, chefs, farmers, activists, and other community members to address the question "what *should* be on our plates for Dinner in 2040?" ("Dinner"). A creative and speculative exercise that digitally archived participants' narratives, values, concerns, and hopes in response to that question, Dinner 2040 was modeled on an actual public dinner that took place in the street along multiple blocks of downtown Phoenix and that used media old and new (including vinyl illustrated placemats) to galvanize conversation about the ecological prospects and possibilities for the region's food system.

Keeping in mind the experimental and participatory structure of Dinner 2040, I would highlight another prototype for ecological media studies in which generating public engagement with a city's ecological futures animates a participatory project that is at once artful and activist: Play the LA River. A project cofounded by the urban planner John Arroyo, the designer and documentary photographer Barron Bixler, the artist Amanda Evans, the historians Catherine Gudis and Jenny Price, and me (and in which LeMenager, a coeditor of this special cluster, was an early collaborator), Play the LA River took shape as a mix of environmental outreach and socially engaged participatory art. Grant Kester defines "socially engaged" art as collaborative creative work outside the "international network of art galleries and museums, curators and collectors," which adopts a "process-based

approach" aiming to catalyze conversation, community, and social change (xiii, 9, 1). Play the LA River can be described in kindred terms: a public call to communities across Los Angeles, especially those living along the fifty-one-mile length of the Los Angeles River, to "enjoy, reclaim and reimagine the river as a civic space that can green and connect" urban communities ("Play"). The project sought to support ongoing environmental and social justice efforts and to widen the public sphere around those efforts through tactics—in Raley's sense—that made use of print media, digital tools, and community gatherings. The last of these tactics, which proved challenging to implement, centered on a single year (September 2014 to September 2015) of collaborative programming with other groups (in addition to social media prompts to spontaneous river excursions). This part of Play the LA River featured small-scale picnics and riverside zine-making workshops as well as exhibits of site-specific student art and performance, among other events. At the project's center was a playful and playable media artifact that dovetailed with these community efforts: an oversize deck of cards and an online interactive companion that each worked as a provisional and open-ended guide to fifty-two sites along the Los Angeles River. This mix of print and digital media, live gatherings, and distributed participation made Play the LA River an experiment in employing tactical media and participatory art to foster and make publicly visible community involvement and investment in urban ecologies.

Projects like Play the LA River and Dinner 2040 demonstrate how the environmental humanities—in turning toward the digital—might turn outward to ecological media practices and publics. Such projects expand the purview of ecological media studies beyond the critical analysis and cultural study of digital materiality to include creative uses of digital technologies and new media, which in turn become lively materials for imagining

environmental crises, layered histories, and alternative futures.

Notes

1. Buell, *Future* and "Ecocriticism"; Buell, Heise, and Thornber; Heise, "Hitchhiker's Guide," *Sense*, and "Ecocriticism."

2. Influential work in postcolonial ecocriticism includes that of Cara Cilano and Elizabeth DeLoughrey; DeLoughrey and George Handley; Graham Huggan; and Rob Nixon; environmental justice cultural studies has been developed by, among others, Joni Adamson, Mei Mei Evans, and Rachel Stein; T. V. Reed; and Michael Ziser and Julie Sze.

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