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Volume 15 Number 2[2021 15.2](#) | [XML](#)**“Beyond the Word:” Immersion, Art, and Theory in Environmental and Digital Humanities Prototyping**Hanna Musiol <hanna_dot_musiol_at_ntnu_dot_no>, Norwegian University of Science and Technology**Abstract**

“Beyond the Word” explores the entanglements of Digital and Environmental Humanities (D&EH) with the word and textuality — but also *beyond* the word and text — with bodies, art, and digital apparatus at its center as narrative, speculative, performative, and immersive instruments. Specifically, this article details efforts to incorporate mixmedia immersive literate, sonic, and visual art as a vehicle for teaching critical, speculative D&EH at a time of global ecological and digital transformations. Using two transdisciplinary humanities initiatives developed at the Norwegian University of Science and Technology as test cases, this text focuses on pedagogical prototyping experiments that encourage nondeterministic uses of, and thinking about, digital tools as vehicles for poetry, transmedia environmental storytelling, critical theory, ethics, and immersive archival reimagining. The article covers the design process and sample activities incorporated to transform the multimodal literature and theory classroom into inclusive, immersive commons, and it concludes with a reflection on the ethical ramifications of such D&EH work.

I . . . approach the computer as a theatre machine.

—Nancy Mauro-Flude (2016)

. . . text mining . . . usually begins with The Word. We extract The Word; we count The Word; we stem The Word to its root; we parse The Word; we name The Word; we disambiguate The Word; we collocate The Word; we count The Word again; we apply an algorithm that allows us to reconstruct the world of The Word as one we can visualize as a list, as a line graph, as a histogram in small multiples, or on big screens. We use the view this new world provides us to interpret The Word.

—Tanya Clement (2016, 534)

The surface of the body is a thinking, feeling surface. . . I cannot stop touching the speech of the body.

—Erin Manning (2007, 9)

“Beyond the Word:” Immersion, Art, and Theory in Environmental and Digital Humanities Prototyping

Figure 1. Amanda Ackerman and Dan Richert, *Unknown Giants*, Kunsthall Trondheim (2017). Photo by Aage A. Mikalsen, Kunsthall Trondheim. Used with permission.

Neither language, nor poetry, Amanda Ackerman (2014, n. pag.) reminds us, can be “be entirely, and only, human.” Unlike Digital Humanities (DH) theorists who mainly explore the entanglement of human and computer languages, Ackerman and her collaborator, Dan Richert, the American transmedia poets and artists behind the 2017 *Unknown Giants* poetry installation, produce poems together with algorithms, humans, and nonhuman *living* organisms such as plants (Figure 1). Ackerman and Richert, the poetic duo, have long experimented with electronic, biosensing poetry, exploring, for instance, words as well as the ability of plants, measured through technological mediation, to respond to poems being read to them by humans. Thanks to their unique sensitivity, called “capacitance,” plants interact with electric impulses that human bodies, and sound, specifically, generate (Richert in Ackerman 2014). In their poetry installation exhibited as part of *Et Nytt Vi / A New We*^[1] (2017) at Kunsthall Trondheim (KT) in Norway, Ackerman and Richert (2017) reintroduced these unlikely collaborators and poetry co-designers, fellow human primates as well as magnolia, piceae, and eucalyptus (Figure 1). In this installation, the plants’ response to human proximity was recorded using volatile organic compound (VOC) sensors measuring terpenes levels. The exploratory, creative, and protective response of plants^[2] — terpenes shield plants from insects — was translated into textual-poetic phrases in English, displayed on a TV, and timestamped and saved for future use. The result of this machine–human–plant encounter was a situational poetic immersive text,^[3] a technosomatic archive of intimacy, fragility, and danger.^[4] Digital technology operated in their work as “a Form of Art” [Antonisz, quoted in Kordjak-Piotrowska 2013] but also as “an art of living” [Tsing et al. 2017], binding different poets together — artists, this author, students, magnolia, and algorithms, helping different poetic stakeholders symbiote and create.

Ackerman and Richert’s expansive, multi-agential biosensing *Unknown Giants* poetry has yet to be routinely taught in American literature or DH studies survey courses, but such multimodal, interactive digital-sensorial literature will certainly arrive there eventually. At the moment, however, few literary studies and theory classes engage in training in and interrogation of critical, poetic, and speculative affordances and uses of digital technology as a vehicle for non- or postprint, new media literature and critical theory — paradoxically so, since multimodal cli-fi or electronic, biosensing, or electronic theatre, and AI-generated literature are not new, and calls for critical and comparative media interrogations of their different modalities and affordances, of entangled histories of “expressive languages” and their “aesthetic variables” at the time of print literature’s waning dominance, are more than a decade old [Fusco and Dominguez 2003] [Hayles and Pressman 2013, vii] [Manovich 2001, 8] [Raley 2009] [Simanowski 2011] [Thurston 2013] [Zylinska 2020, 123]. In that context, Warren Sack’s (2019) call for an institutional reclamation of *liberal arts* [my emphasis] as the foundation of “software arts” and a rethinking of DH’s marginalization of aesthetics, specifically, sounds as belated as it is urgent. Critical digital bio art and media studies practitioners [Manovich 2001] [Mauro-Flude

2016] [Mauro-Flude 2019] [Ackerman and Richert 2017] [Lee 2017] [Noble 2019] model such reclamations and often challenge the “monstrosity of [institutional] monocultures” [Swanson et al. 2017, M6]. Literature and literate arts programs, especially at the undergraduate levels,^[5] can learn from them how to restore the focus on aesthetic practice and digital humanities ethics within the institutional setting.

“Beyond the Word” is an empirical and experimental case study, exploring such practices and pedagogies in the work undertaken by the author, her collaborators, student participants, and partner institutions between 2017 and 2018. The article details our efforts to prototype immersive art-centered D&EH instruction that emphasizes nondeterministic, creative, and reflective approaches to digital tools, which involved designing new syllabi and coordinating and teaching courses at Norwegian University of Science Technology (NTNU); developing public programming curricula — public talks, screenings, workshops, and co-curated immersive exhibits events — for undergraduate students in the Literature, Cultural Studies, and Teacher Training programs at NTNU, Trondheim-based migrant community members, and the general public; and, collaborating closely with several city and university partners: KT, Trondheim Kommune / The Trondheim Municipality (TK), and NTNU ARTEC. Redesigned literature courses discussed below engage thematic and practical considerations in DH & EH — transmodal creative forms, preservation, archives, speculation, and collaboration and ethics. This article traces their entanglements with the word and textuality — but also moves *beyond* the word and its “capture and measurement” [Mauro-Flude 2019, 205] — with art, digital apparatus, and bodies used as narrative, speculative, immersive, and performative instruments. Ultimately, “Beyond the Word” reflects on what can happen when digital *and* environmental humanities come into close contact, if not *touch*, in the contemporary literature and theory classroom, and, often, when the art(ist) is literally present,^[6] to reveal the poetic, speculative, performative, and ethical contingencies of digital tools.



Figure 2. Rosemary Lee, *Symbiotic Sound* (2017). Blurring the boundaries between artifice and “nature,” aesthetics, biology and technology. Photo by Aage A. Mikalsen / Kunsthall Trondheim. Used with permission.

Background: A D&EH Landscape

Despite the limited presence of art-centric D&EH literature curricula, techno-organicist preoccupations with aesthetics and environments, with the living and mechanistic, are not absent from DH and EH projects and scholarship. They are common in, for instance, virtual worlds preservation work, alternate reality game (ARG) collaborations, and the examination of the deterioration and disappearance in technology and ecology in an era of the Anthropocene [Kraus 2019] [Mauro-Flude 2019] [McDonough et al. 2010] [Nowwiskie 2015] [Nowwiskie 2018] [Nowwiskie 2019] [Simanowski 2011]. Ursula Heise (2002) and Margret Linley (2016, 410–37) theorize how nature metaphors shape digital architectures and discourses,^[7] while others address the social, gendered, racialized, and colonial thinking that undergirds our understanding of nature *and* digital environments.^[8] Importantly, EH, like critical media studies committed to the entangled materialist critique *and* aesthetic analysis, is explicit about seeing “nature” and “technology” as ideological and historical formations and as living, biophysical, aesthetic, organic and nonorganic, or *machinistic* objects [Laboratory for Aesthetics and Ecology 2019] [Tsing 2012] [Tsing et al. 2017] [Haraway 2008] [Haraway 2016] [Nowwiskie 2018].^[9] DH’s institutionalized focus on “precision-defined models of scaling” [Tsing 2012] and its “messy institutional realities” [Hunter 2019, 189], on the other hand, often preempts a similarly complex understanding of its aesthetics and politics. This leads some to worry that instrumentally deployed “digital methods,” algorithmic criticism among them, may “ero[de] our most unique facility in the humanities,” such as “the aptitude for fine-grained and careful interpretive observation” [Nowwiskie 2019, 425],^[10] its capacity for “contemplation” [Mauro-Flude 2019, 219],^[11] and, in particular, its engagement with aesthetics and performance.

In Norway, as worldwide, as ecological and digital crises intensify, digital and environmental concerns do seep into the university curricula and research labs, often under the rubric of “sustainability” and “digital transformation” research foci.^[12] However, DH and EH, and DH and art, are still segregated into different university and external funding, certification, and instruction schemes, and the national commitment to the extraction economy makes funding and sustaining *critical* liberal arts-based D&EH initiatives challenging.^[13] Locally, NTNU, the well-funded and largest research university in Norway,^[14] is an institution with technological and sustainability foci but minimal contemporary critical theory, DH, or digital/media literacy instructional tradition as of 2019. Moreover, and paradoxically, NTNU offers minimal DH infrastructural and practical tech and humanities project-development support.^[15] Thus, when Safiya Umoja Noble (2019, 27–28) invokes Audrey Lorde’s, Roopika Risam’s, or Kent Oto’s work, or when Miriam Posner (2016, 41) contends that “scholarly expertise in critical race theory, feminist and queer theory, and other interrogations of structures of power” is “the most complicated, challenging *computing* problem [my emphasis]” of DH, locally, the absence of a critical humanistic and DH curriculum prevents students and junior DH practitioners from even seeing computing and critical theory as interrelated, let alone from seeing computing dilemmas *through* a critical theory lens. In that landscape, and in contrast, new media, art, design and EH initiatives in the region that extend beyond the university are often sites of unapologetic experimentation with critical theory *and* liberal and “software arts” [Sack 2019] [Musiol 2020] [Musiol forthcoming 2021] [Sack 2019]. Trondheim’s own cultural infrastructure — with at least five contemporary art institutions explicitly dedicated to contemporary and, thus, digital/electronic art^[16] — provides a robust collaboration ecosystem, unparalleled, perhaps, by most standards for a city of under 200,000 residents. Institutions such as KT, with an official mandate and resources to engage with environmental and mixmedia art and the public, can easily expand the university classroom and open possibilities for interactions with new forms of digital and biosensing storytelling, theorizing, experimentation, and reflection.

Together with our collaborators, we assumed that literary studies students and scholars in training, familiar with interrogating and *playing* with aesthetics, with literary techniques and technologies, would welcome explorations of the performative and poetic approaches to digital narrative tools. Thus, when preparing our courses, we relied heavily on the external art networks that support such work. The first elective course, “Literature, EH, and *The Arts of Living on a Damaged Planet* (LEHALDP),”^[17] was developed in close partnership with KT’s *A New We* (2017) transspecies and transmedia storytelling exhibit co-curated by from the Laboratory for Aesthetics and Ecology (2019), the NTNU ARTEC, the NTNU Academic Guest Network / NTNU for Refugees, and the resettlement/integration unit of TK (the Trondheim Municipality). Our advanced theory course, “Theoretical Approaches to Literary Studies: A Toolbox for Literary Analysis (TALS),” also relied on these partnerships, if only for shorter D&EH modules (in 2017 and 2018). Both initiatives promoted inclusive teaching and transmodal D&EH scholarship, with a focus on environmental digital literature and art practices, and performative, creative, and reflective uses of digital tools. Since both courses were imagined as university D&EH initiatives as well as community-engagement resources, they required a rethinking of what and where the classroom is and what it does — and, also, who is included and welcomed to be part of it. Creating an inclusive commons, then, as an immersive space for observation, performance, storytelling, experimentation, and reflection, was a practical and ethical precondition, one requiring intense preparation and multiple stakeholders.^[18] The extensive urban digital art infrastructure helped us grapple

with this conundrum. Although the NTNU literature program (ISL/HF) was an official pedagogical base, with its traditional classroom, the library, and reading lists, most of our work happened at and with KT^[19] rather than in the university classrooms and its digital or media labs. KT, which transformed into a human-machine-“multispecies salon” [Kirksey 2014] (Figures 1–2) with its immersive storytelling and installations co-curated by Ida Bencke and Dea Antonsen from the Laboratory for Aesthetics and Ecology (2019), was integrated into our weekly assignments, gallery visits, public writing and creative digital storytelling and DH workshops, as a context for and *objects* of our work (Figures 1–4).

There were also several other reasons, beside those outlined above, for a close collaboration with KT. All classes at NTNU and all external programming (at KT or other partner institutions, such as the Falstad Human Rights Center) were open to students and to Trondheim’s permanent and temporary or transient residents, free of charge and without bureaucratic barriers.^[20] However, access to NTNU’s digital environments (hardware and software, DH training, tech support, library services, and even basic university student discussion platforms), while free in Norway, reinforces the digital divide, as it is restricted to registered students in ways that purely physical access to the classrooms and libraries in Norway and most of Europe never is.^[21] KT, on the other hand, literally allowed *all* interested participants — registered students, invited guests, residents, (im)migrants, asylum seekers, one-time lurkers, and other participants of various abilities — to play with, perform, and observe nonconventional use of digital technology art installations. Finally, the immersive exhibition setup encouraged the use of multiple senses and did not privilege ocular, or monolingual or textual proficiency. This was important for some community members whose mother tongue was neither English nor Norwegian, and to neurodiverse participants with different narrative preferences, and digital, or physical access needs.

Collaborative Course Design

The Public Classroom

Prior exposure to and learning from critical internet practitioners [Mauro-Flude 2016] [Kraus 2019] at local and national conferences^[22] was instrumental and emboldened us — the art-literature-new media collaborators based at NTNU, within the municipality, and at local art institutions — to seize the opportunity to experiment with D&EH to incorporate digital, immersive, bio-, and electronic art into the undergraduate literature classrooms in lieu of more instrumentalist DH training.^[23] We consulted EH and DH scholars, artists, curators, and practitioners on the syllabi and public programming in order to spur critical reflection and creative work using transmodal art. Some of our collaborators — Krista Caballero, a US-based mixmedia artist, exhibiting at the time at KT; Sissel Bergh, a Trondheim-based mixmedia artist mapping the South Sámi culture in the region; Marco Armiero, an environmental historian and the founder of the Toxic Bios digital archive at the Swedish Royal Institute of Technology (KTH); Henry Mainsah, an Oslo-based digital media scholar, designer, and speculative prototyper; Lisa Dush, a US-based new media and rhetorics scholar; and Carl Faurby, a curator and educator at KT — co-designed or guest-taught portions of our courses. Drawing on Brennan’s (2016) public DH work, together with the KT team, Carl Faurby and Helena Holmberg, we also collaborated on linking our literary and theory studies curriculum to public digital environmental art programming and film screenings. Crucial for the inclusive format of the courses was the practical support of Adria Sharman, the official of TK, who successfully advocated for a 75% reduction in textbook pricing for refugee academics; the NTNU Humanities Faculty’s small pedagogical grant, which covered transportation and D&EH workshop costs; and the decision of KT’s then director, Helena Holmberg, to ensure fee-free entrance to KT on all days to all participants, regardless of their immigration or student status.

Pedagogical Toolbox

Aside from required literary studies skill, we wanted to foreground the aesthetic and reflective potential of digital tools. Each week, we paired print literary and theoretical texts and specific interactive installations at KT with EH and DH keywords (symbiosis, collaboration, and postprint immersive literature; species extinction and conservation and digital preservation and archives; biosocial toxicity, digital waste, and ethics, etc.) and experimented with performative, immersion, prototyping, and theory-making workshops. We felt that experimentation and prototyping can help us “reappraise . . . the utilitarian design” of DH [Mauro-Flude 2016, 167] [Mauro-Flude 2019], and we aimed to combine “the speculative inventiveness of design” and “the critical interpretation of the humanities to imagine what might be accomplished with digital tools *that don’t yet exist*” [Burdick 2015, 14]. In the process, we had to draw from diverse critical pedagogy and disciplinary traditions — public humanities, postcolonial studies, DH, EH, design studio and art pedagogy, and critical media/internet studies — and developed a series of interconnected reiterative activities, some deriving from the traditional print-based literary studies and others from multimodal writing and the design pedagogy toolbox [Brennan 2016] [Mauro-Flude 2017] [Musiol forthcoming 2021]. The multi-genre and multimodal activities enabled a recognition of neglected forms of nonprint post/decolonial storytelling and meaning-making and speculations.^[24] The aim was to build on *and* enrich our own and our students’ DH and literary studies training — involving critical reading, watching, deep listening, aesthetic and cultural analysis, curriculum design, and so forth — with performative, immersive, *enacting* co-creation activities and collaborative methods common to critical making, performance studies, and speculative design.

“Embodied Contemplation”/ Immersion as Reflection

Importantly, our activities and experiences were not simply hands-on but, often, words-off, other-senses-on, with a focus on reflection and immersion, an approach that warrants its own entry. Against better advice, we centered on continuous meta-reflections on the learning processes and specific encounters with texts, artifacts, and living organisms, foregrounding epistemological ruminations on analog and digital technology and D&EH art and literature in each class, exhibit visit, or workshop activity. In that sense, we reversed the order of Hayles and Pressman’s (2013) dictum “making, critique,” by beginning, counterintuitively, with theory and critical reflection. Ryan Cordell (2016, 460) warns against such “meta-discussions . . . [that] too often preclude engagement with its projects and theoretical engagements.” He suggests that students, unlike administrators and professionals, are not invested in the debates about the field or the disciplines (460–61) and implies that these conversations should follow, not preempt, the examination of case studies. We had heeded his advice in earlier practical workshops, and it had served us well. That time, however, we wanted to experiment with foregrounding theory, ethics, and reflection as missing “foundations of [D&EH] design” [Zunger 2018] and to address the absence of critical theory in our institutional setting, specifically. We knew that we could take advantage of our unique immersive environment to generate instantaneous “critical affect,” that is, to make bodies *feel* critically, as well as to *think* critically. To this end, we used immersive multisensory environments at KT to engage with biodigital, physical, and political “touch” of multimodal storytelling, in spaces literally oversaturated with competing human and nonhuman bio and digital stimuli, enhanced by interactive digital tools such as algorithms, VOC terpene sensors, digital screens, the ambisonic sound system, and more [Manning 2007] (Figures 1–4).^[25]

The corporeal-reflective impact of this immersive method, engendering multisensory, machine-mediated somatic interactions and “unleashing affect” as an epistemic and critical tool, exceeded our expectations [Holmes 2018, n.pag.]. It resonated strongly with participants, challenging many assumptions about what students/participants want, know, or prefer. “[C]omputational technologies do not only reveal new insights about postdigital culture,” observes Nancy Mauro-Flude (2019, 219), they “also transform propensities for *embodied* contemplation, a subject at the heart of humanities scholarship [emphasis mine],” and, in our experiences, immersive art installations facilitated precisely such corporal humanistic reflections. Initially, our literature and humanities students, mostly newcomers to EH and DH, and to contemporary art, were more comfortable with the dominant role that ocular sensations, words and reading specifically, play in the process of learning and interpretation. As Cordell (2016) predicts, they were not troubled by disciplinary limits that a literature class may impose. However, as they encountered environmental print theory and fiction, alongside experiencing postprint work and immersive ecological art praxes spatially and in other, nontextual, somatic ways, their very understanding of possible modes of embodied storytelling and knowledge-making expanded, too. Temporarily taken aback by the force of sensory affects and disciplinary bordercrossings, participants soon found the techno-biologist poetic exchanges of affects and capacities between human bodies, machines, plants, animals, and archives both visceral and meaningful [Tsing et al. 2017, M2]. Many were literally and metaphorically *touched* by, for instance, how intertwined literature, digital art, and biology are, or how,

for instance, digital technology “made plants speak to them” in *Unknown Giants* (Vegard Ruud, November 8, 2017^[26]). Some also noted, with fascination, that digital technology became a literary prosthetic and translation platform, which, for instance, “serve[d] as a voice for the plants, and g[ave plants] the ability to tell stories [my emphasis],” allowing us, humans, to hear them (Ida Tevik Haugen, October 31, 2017). Moreover, participants often focused on how digital tools enabled the “co-authoring” and co-archiving role of the audience, spurring further reflection. “The way the artists used the natural scent emitted by flowers in conjunction with technology in order to (re-)create poetry is in itself amazing,” wrote one participant of *Unknown Giants* (2017), “but the fact that the spectators also contribute to the process elevates the installation above the others” (Mats Øien, October 29, 2017). To Mats Øien, and others, the collaborative and performative character of *Unknown Giants* (2017), which “always show[s] unique and personalized output based on the observer(s) present,” demonstrates that “each individual is unique” but also “reminds us that humans are not the only kids on the block” (Mats Øien, October 29, 2017).

Archival Reimagining

Archival practices and preservation technologies have grave implications for the nonhuman “kids on the block,” for our understanding of nonhuman history, species extinction, and for imagining transspecies futures (Mats Øien, October 29, 2017).^[27] In previous courses, we had frequently exposed students to literary digital archives, their preservation missions, feminist or postcolonial ethical considerations, archiving and metadata curation methods, or exhibition techniques.^[28] Given our thematic interest in 2017 in EH, we wanted instead to explore how artists grapple with archival “heritage futures” of nonhuman extinct animal lore ^[Nowwiskie 2018] ^[Nowwiskie 2019].



Figure 3. A video installation by Krista Caballero with sound by Frank Ekeberg from *Birding the Futures: Lab Series* (2017) at Kunsthall Trondheim.

To this end, we turned to one of two archival digital art projects exhibited at KT, Krista Caballero and Frank Ekeberg’s *Birding the Future: Lab Series* (2017), a mournful project on avian storytelling and species extinction (Figures 4–5).^[29] This archival installation used visual projections and an ambisonic speaker setup to spatialize extinct and nonextinct bird sounds (Figure 3) which enveloped visitors in an imagined, impossible sonic landscape of zebra finches — common lab birds of our era — and of the extinct Hawaiian Kaua’i ‘ō‘ō honeyeater birds. The installation also activated multiple senses — sight, touch, hearing — immersing visitors in historical and speculative sounds within this archive and a transmedia elegy for the biodiversity, soundscape, and cultural lore lost. For instance, participants watched oversized, looped footage of distraught finches handled with lab instruments in an ornithological laboratory (Figures 3–4) while immersed in the archival and speculative soundscape. But while the video projection was consumed more passively, visitors also played with vintage stereoscopes, examining Krista Caballero’s composite cards and their different visual and tactile handling of human-avian stories (Figure 4).^[30] This transformed the gallery into a historic and imaginary, multisensory, dynamic, participatory archive^[31] eliciting different ways of hearing, feeling, reading about the transspecies entanglements (see Figures 4 and 5).



Figure 4. Playing with stereoscopes and a stereograph from *Birding the Future: Lab Series* (2017) Lab Series, 2017. Photo by Krista Caballero / Kunsthall Trondheim.

Like *Unknown Giants* (2017), *Birding the Future’s* (2017) archive depended on various digital and new and old media technology, such as hearing- and vision-enhancing analog and digital tools — video projectors; vintage stereoscopes; composite illustrations based on images taken with digital cameras and then processed with Adobe Pro, Photoshop, and Illustrator; as well as the vector-based amplitude panning algorithm; a multichannel audio (ambisonic) sound spatialization system; and a Raspberry Pi setup — to collapse the temporal distinctions between the irreversible past, the now of the exhibit, and the anticipated future. But their use of sound, visual, and computer technologies was not simply functional and prosthetic — enhancing human vision and hearing — but epistemological, speculative, performative, and “scriptive” ^[Bernstein 2011]. To Bernstein (2011, 12, 69–91), archival work is often a feat of forensic and performative imagination about how historical objects were and *might* have been used. If what no longer is can only be imagined and speculated about, the installation reminded us that imagination and performance are also indispensable, if neglected, *research* skills, and that technology can enable this complex understanding of research.

Such complex, multilayered, conflicting use of technology made students instantaneously aware of its obtrusive presence, of technologies’ histories, and of their speculative power in this archive (something we had been trying to expose in other DH classes, but with less success). Eirik Klakegg Thorsen wrote, for instance, that the installation offered “a great example of how technology can both be a distraction and the only possible way to really *imagine a historical moment* [my emphasis].” He continued:

I thought that the stereoscope took some of the focus away from the extinct birds and drew the focus more over on the actual technology itself. If the speakers and video were . . . placed in a dark room where one could have focused solely on the sound and picture (or only sound), and tried to imagine the significance of why they [birds and their sounds] are gone, and not get distracted (by the first pair of stereoscopes I have touched since my childhood), I think the experience would have been even

more powerful. But then, the artwork becomes much darker, without much hope, and the story about the birds is completely different. The digital sound and video of the birds show how digital technology may be the only possible way to archive some types [of] *historical moments* [my emphasis]. One could probably argue that it would be possible to paint a lifelike picture of the birds and maybe even describe a sound by the use of words and musical "notations," but I would argue that, at least for the sound, it would not be possible to *do the imagination without the technology* . . . (Eirik Klakegg Thorsen, November 1, 2017; my emphasis)

While DH often engages in more positivist forensic archival work, in this installation, vintage and new technology (stereoscopes and turn-of-the-century recordings) in particular operated as "scriptive" historical objects [Bernstein 2011], inviting audiences to touch and use them to imagine ways in which they had been used historically, replicating ways of seeing and hearing "nature" at the beginning of the previous and in our century. Just as our students did not initially consider that storytelling might take on transmedia forms, or that algorithms and magnolias can become poetic partners in crime, their initial understanding of history-making and archives derived from their trust in an objective and static textual record of human experience.^[32] Stereoscopic technology challenged such views; it produced a sense of archival multidimensionality and embodiment as it layered different genres and realms of touchable knowledge (science, cards, visual art, and transnational poetry) across time but also encouraged a performative, multisensory, digital-tools-mediated engagement with the archive (Figure 4).

Like *Unknown Giants, Birding the Future* activated an embodied historical, fleshy, archival sensorium; foregrounded multipurpose and multimodal affordances of digital and analog technology and art; and revealed the critical force of affect produced by immersive visual, sound, and digital tools. Moreover, participants also became attentive to the challenges of creating non- or trans-human stories archives, wondering how one can acknowledge the agency and "voice" of nonhuman "others" when these extend beyond human cognitive capacity. Moreover, this archival installation managed to raise with course participants the important questions in literary and D&EH studies about access and presence in archives. Who belongs in a "heritage future" [Nowwiskie 2018]? How can we preserve, display, care for nonhuman lore, without using violent practices and instruments of captivity (Figure 4)? We also wondered what constitutes ethical "collaboration," storytelling, archival evidence, or historical "heritage" in that context. Ultimately, students and community residents came away from the installation with a different understanding of the role they can play in the archives and in the networks of ecological preservation, interpretation, and care.

Prototyping Theory Designs^[33]

"Experiential prototyping," according to Nancy Mauro-Flude (2017), is a "dynamic" and "performative" practice that sits "at the intersection of hands-on practice and critical making" (167). It is a creative community-building practice, and it allows us to examine the material, futuristic, and ethical consequences of technological design. During the concluding sections of our courses, we re-turned to reflection in participatory prototyping workshops, following models by Ackerman and Richert (2017) in their biosensing poetry and art, Caballero and Ekeberg's (2017) audiovisual speculative archive, and biotechnological blurring in Lee (2017). Led by Henry Mainsah, we experimented with critical design prototyping to speculate about ideas and things "which do not yet exist" [Burdick 2015, 14] [Mauro-Flude 2016] [Mauro-Flude 2017]. In order to achieve that, we borrowed elements of design studio pedagogy, especially the format of "design charrettes," intensive and "scaffolded" activities designed to help with "giving material form to theoretical ideas, and developing and critiquing proposed solutions" [Howard and Somerville 2014].



Figure 5. Prepping for prototyping with Henry Mainsah. Photo by Gulabuddin Sukhanwar. Used with permission.

In his previous work, Mainsah had engaged in such critical digital design thinking and co-making, using in his pedagogical work with students, for instance, speculative Twitterbots, which aimed to disrupt debates about the environment and climate change denial on Twitter. He also incorporated WATCHA, a "fictive *disobedient* wearable object [my emphasis]" [Morrison, A. 2015, n.pag.], which plays with the quantified self, the internet-of-things, and self-surveillance culture. Using WATCHA, a "design fiction" artifact [Morrison, A. 2015, n.pag.] that "tracks time not as we know it as a man-made construct, but as a feeling," introduced students to speculative methods of research, helping them investigate "the relations between humans and technological products [in] their everyday use," and reflect on different understandings *and* sensations of time (Henry Mainsah, personal communication, July 28, 2021). Similarly, his prototyping D&EH workshops at NTNU aimed to explore the reflective and the speculative capacity, as well as the community-building potential of the prototyping process. Mainsah drew specifically from the work on "provotypes," that is, prototypes that aim to make cultural claims, "interrupt people's thinking," and "astonish" or "disturb" them [Ruecker 2015, 9].

In the first workshop, we worked with course themes, texts, and exhibition keywords (symbiosis, transspecies storytelling, extinction, toxicity, time, extraction, etc.). First, we gathered textual and physical materials on the subject. Its delightful list of D&EH ephemera included a humanoid robot's Norwegian citizenship test, initiated by Minh Chau Pham; a toxic "*concept* Fake news [my emphasis]," which, Arnt Furunes argued, "embodies the *technological* manipulation of data, misrepresentation of fact, rhetoric and speculation, to make up falsehoods, twisted truths, monsters and ghosts out of voices [my emphasis]"; Karoline Johansen's pair of socks (!), called "Leftover yarn project – not waste"; Øystein Bjørklund-Lassen's picture of "El Pulpo Mecanico, a mutant-vehicle";^[34] and Nina Vitashenko's "bag of CRISPRs" (November 16, 2017). Then, in small groups, we co-wrote short curatorial statements about them and sketched "rapid prototypes" of our inventions that "could raise awareness, stimulate discussion, or provoke debate about an important ecological issue."^[35] Finally, we presented them to a wider audience and reflected on them on our blog.^[36] One of our digital toxicity "provotypes" [Ruecker 2015, 9] was an eerily familiar Fake News Cockatiel©©, described as "an amalgamation of . . . an internet-connected artificial-intelligence voice, reminiscent of Apple's Siri and Amazon's Alexa, in a plastic housing shaped like a cockatiel." "Its main function," the design group representative explained, was "to trawl the net for fake news to recite to its owner. The device [was] voice operated, [with] redundant buttons and . . . a set of equally redundant spare buttons. The Fake News Cockatiel ©© [was] also fully ambulatory; it would creep around at night, seeking new vantage points from which to more effectively misinform . . ." (Arnt Furunes, November 9, 2017).

The second workshop, with a different group, focused explicitly on theory, and the task was to prototype futuristic theory devices, some eerily reminiscent of Slavoj Žižek's "theory glasses," that could instantly "generate a radical analysis of a cultural text."^[37] In both, we followed Burdick's (2015, 15) invitation "[t]o identify processes or methods specific to the challenge of designing Digital Humanities' futures" and to blend "the generative — methods that look forward, asking 'what if?'" and "the reflective ones that reveal or critique 'what is.'" In Burdick's

In both workshops, hackneyed tech buzzwords — rapid prototyping, innovation, invention, disruption — so cliché and common in DH, at NTNU and beyond, as well as ephemeral concepts, tools, and environmental concerns, were brought together and played with critically, tongue-in-cheek. As participants scrutinized and challenged them in their “provotypes” [Ruecker 2015, 9] they also reflected on the questions their speculative inventions invited or suppressed, the potential users they would gain or lose, and the troublesome issue of legal and commercial ownership. Again, the emphasis on experimentation and its consequences was key, “enabl[ing]” students to “unrave[l] the tangled mess of ideology, narrative, and possibility” and to “reflect upon their learning, diagnose their design process, and map their impact as designers” [Ward 2015, 231]. The workshop evaluations supported Ward’s observations and included numerous meditations not simply on the prototyped object or concepts but on the importance of the process and the playful and grave ramifications of speculative designs. [38] Participants also noted the expanded understanding of the impact of digital technology on their disciplinary and theoretical vocabulary, and on their interpretative practices. Foregrounding the speculative, poetic, critical, and philosophical potency of digital tools concretized for us and course participants the idea that ethics and theory are digital building blocks — and that they are the building blocks that are often missing. Ultimately, speculative prototyping, a workshop activity enabling creative, transmodal (sonic, somatic, tactile, kinetic, and textual) practices, became a framing metaphor for our pedagogical work within DH [Mauro-Flude 2017] [Mauro-Flude 2019], giving a name to our byzantine D&EH teaching efforts and this article itself.

Reflection

In our context, institutionalized, “semi-normal[ized]” DH, unlike in critical internet or media studies, which celebrate new textual modalities, immersive, transmodal narration, and the poetics and theatre of the digital [Mauro-Flude 2016], “semi-normal[ized]” DH in our institutional context often excludes emergent twentieth- and twenty-first-century digital art, poetry, and storytelling from the curricula [Ackerman and Richert 2017] [Underwood 2019, 96]. Critical media art has much to teach word- and print-focused DH literary analytics, then, especially in terms of fostering noninstrumentalist experimentation with aesthetics and appreciation for “creative exuberance and innovative form” [Hayles and Pressman 2013, xiv]. Moreover, Risam et al. (2017) are right to point out the public mission obligation, especially at public-mission-oriented institutions, to attend to the digital and media literacy needs of undergraduate students. Institutional DH infrastructure, when available at all, is often built so as to neglect the needs of students whose career paths lie outside doctoral research and are instead often in cultural sectors, in public education classrooms, and local communities. DH’s focus on “logocentric practice[s]” [Clement 2016, 534] and on systematic and deliverable projects is, of course, warranted, needed, and should not be avoided, but the somatic, affective, creative, poetic, or speculative digital design practices that often escape “the precision-nested scales” of DH deserve attention and space, too [Tsing 2012, 505]. And so does the emphasis on theory, as a design element. And on artistic practice and performative methods. Engaging in critical design processes and art-centered pedagogical activities re-centers on the theoretical, methodological, and ethical dilemmas of the humanities, including digital and environmental ones, of liberal arts, and makes these *matter* in an undergraduate classroom and in the community [Sack 2019].

Moreover, if theory and ethics are to shape design, we must make more room for them, if little of both is available at the undergraduate and pre-PhD levels elsewhere in our institutional setting in DH, humanities, more broadly, and in computer / information science training, alike. After all, scholars and academic and industry practitioners insist that critical race, disability studies, queer theory, or environmental justice praxis are foundational to digital literacy and are “computing” or design “problem[s]” themselves yet to be tackled [Posner 2016, 14] [Hunter 2019] [Noble 2019] [Mauro-Flude 2016] [Mauro-Flude 2019]. Wachter-Boettcher (2017) writes explicitly of lethal “threats of toxic tech,” of “biased algorithms” and racist and “sexist apps,” and such “toxic tech” is seen as a direct human rights and social justice threat [Algorithmic Justice League 2020]. If, in practice, “safety and ethics” are “specialties, rather than the foundations of . . . design” for “[s]oftware engineers,” who still “believe they just need to learn to code, change the world, disrupt something,” without “the responsibility that comes with building things . . .” [Zunger 2018, n. pag.], we should acknowledge that, locally, critical theory and ethics often are the scarcest and most frequently missing resources in DH [Hunter 2019] [Posner 2016]. If we are to explore the noninstrumentalist potential of D&EH, we have to make it our central pedagogical focus. Agonizing over inaccessibility of DH infrastructure — hardware, software, DH tools training, library access, tech support availability, digital accessibility, and more — is a crucial consideration. But if we decide to explore and nurture “the speculative inventiveness of design” [Burdick 2015, 14], we cannot forget that critical theory instruction within DH matters, too, and that it is often absent — its absence a building block of toxic hardware that we build and the DH projects we fund.

Critical design and mixmedia art practices already tackle the human-machine interaction through the lens of critical theory and art, often literate and performance arts, and engage with ethics, reflection, social critique, and “the speech of the body,” as foundational, not peripheral, components of knowledge-making [Manning 2007, 9]. For us, Mauro-Flude’s (2019) digital practice-based theory of “performing the internet,” proved essential. In her view, nondeterministic, disobedient use of digital tools it requires shifting away from the notion of “use” of digital tools to the practice of, in our case, biodigital, speculative, immersive-reflective “performance.” Understanding digital tools as performative and sensorial instruments, or as Antonisz did, seeing technology, broadly, as an expressive “form of art,” we have realized, may be another aspect of digital literacy and theory we are not teaching, but we should [Kordjak-Piotrowska 2013]. If we open D&EH pedagogy to embrace the ephemeral, immersive, performative, questioning uses of technology, we may be able to imagine and cocreate other, noncorporate models of digital “arts of living” and embodied and meditative bio-sociality [Tsing et al. 2017] [Mauro-Flude 2017, 169].

Our D&EH initiatives depended on existing art and knowledge networks of collaboration, within and *outside* academia, to fulfill this utopian aspiration, while also addressing specific and practical institutional needs and gaps [Musiol forthcoming 2021]. Therefore, using art modes of immersive inquiry within D&EH knowledge- and theory-making might not work in other institutional contexts, and with different literature, art, critical theory, or DH instruction traditions; we certainly do not propose it as a replacement for a more instrumental DH curriculum. However, prototyping immersive D&EH has opened unexpected portals for us, which itself may be instructive for educators and scholars interested in digital aesthetics and the noninstrumental potential of D&EH. Working in the immersive environment at KT, for instance, brought debates about the place of ethics, theory, and transmedia aesthetics back into to the D&EH literature classroom. It also helped students recognize that these conversations take place outside the university, too, and that they themselves can *play* an important part in them. Moreover, pushing “beyond the word” led us to explore digital technology and the human/nonhuman body as “thinking, feeling” interfaces, and *experience* viscerally, collectively and individually, the expressive affordances of D&EH. This, in turn, emboldened us to further experiment with contemplative trans-human co-creation [Manning 2007, 9]. Ultimately, as dutiful students of critical and public pedagogy ourselves [Freire 1993] [Giroux 1988] [Risam 2019] [Risam et al. 2017] [Sandlin et al. 2010], together with Caballero, Mainsah, Armiero, Faurby, Dush, KT, and student/participants, we nurtured the expanded classroom as a complex ecosystem: not only as a skills and content transit zone, but as an “enchanted” social space, a playful and a serious stage, a “multispecies salon,” a sensorial bio-cultural laboratory in which the creative practices of knowledge-making, care, archival research, collaboration, can be *felt*, rehearsed, performed, contemplated, and reimaged [Kraus 2019] [Kirksey 2014].

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Notes

[1] Hereafter cited as *A New We*.

[2] Ackerman argues that the threat-linked interaction was not intended as a focus on the work (personal communication, May 15, 2018). A plant's protective response is nonetheless, at least partially, wired into its biophysical reactions (D. Richert, personal communication, June 20, 2018).

[3] Ackerman (2014) observed in her previous work with various plants and poetry that plants' poetic responses are not dictated simply by biological determinism, as "each plant seemed to have" exhibited poetic preferences and subjectivity, "its own syntactical signature and . . . emphasis on certain cadences, words, or phrase recursions."

[4] Ackerman deemphasizes the fear factor, yet it is nonetheless part of the plant's somatic response.

[5] See Risam et al. (2017).

[6] This is a play on the title of the 2010 MoMA retrospective of the work by the performance art pioneer Marina Abramović [Biesenbach 2010].

[7] Linley (2016) observes that digital realms are imagined and built as environments, natural landscapes, populated with viruses, worms, and other things being born, albeit digitally, replicating a particularly "cultural" understanding of nature and culture.

[8] See Alaimo (2010), Haraway (2008, 2016), Mauro-Flude (2014, 2016, 2019), and Nowwiskie (2019). Feminists and scholars of critical race, postcolonial, or disability studies have long exposed the effects of misogynistic, racist, classist, colonial, and ableist bias baked into the theoretical, methodological, pedagogical, and institutional infrastructure and archives [Fiormonte 2016] [Noble 2019] [Posner 2016] [Posner 2019] [Wachter-Boettcher 2017]. Roopika Risam (2016, 2019) documents the telling concentration of DH centers in former colonial metropolises. Some of the most obvious discriminatory aspects of DH projects and digital environments, their inaccessibility for users with the most common physical impairments, are pervasive. At a November 2019 NTNU DH event, *none* of the tested public university websites were designed with basic digital accessibility in mind. Other well-documented cases of racial, gender/sexuality-, linguistic-, and class-based exclusion derive from this geopolitical distribution of, and limited access to, DH laboratories, software, expertise, and funding [Fiormonte 2016]. The reasons for such a retreat from concerns about equity and accessibility in digital design, especially in Norway, are hard to ascribe. They may be tied to short-term funding models, or to lack of scrutiny of DH projects' inaccessible architecture and research outcomes, but the absence of mandatory training in critical theory, media literacy, and digital accessibility across disciplines is also a contributing factor.

[9] The impact of environmental digital art and EH is particularly important here, not simply thematically but methodically. EH foregrounds the need to engage with nontextual archives, local knowledge, and attends to diverse, often nonlogocentric forms and "genres of observation and storytelling" from across disciplines [Armiero and De Angelis 2017] [Tsing et al. 2017, M3] [Linley 2016] [Nowwiskie 2015] [Tsing 2012] [Whyte 2016].

[10] This concern and "arguments against algorithmic visualization and analysis," Nowwiskie (2019) argues, "are not . . . fueled by nostalgic scholarly conservatism, but rather emerge across the political spectrum."

[11] Again, critical media studies can offer useful models here. See Fusco and Dominguez (2003), Mauro-Flude (2016, 2019), and Mittell (2019).

[12] See the largest funding schemes at the Norwegian Research Council (NFR) at <https://www.forskningsradet.no/en/call-for-proposals/>. Art projects are funded by a separate agency, Arts Council Norway, at <https://www.kulturradet.no/english>.

[13] 2019 is a watershed moment for EH in Norway, marking the official establishment of a four-year nation-wide Environmental Humanities Doctoral consortium program, called NoRS-EH. See https://prosjektbanken.forskningsradet.no/en/project/FORISS/299199?Kilde=FORISS&distribution=Ar&chart=bar&calcType=funding&Sprak=no&sortBy=date&sortOrder=desc&resultCount=30&offset=30&Fag_3=Marin&teknologi.

[14] Its 2019 budget is 9.6 billion NOK. See <https://www.ntnu.edu/facts>.

[15] The particular type of humanities collaboration in Norway with computer science in DH training and project maintenance is also reflection-worthy. Those who teach Python or GIS to humanists (mainly linguists and literary scholars) do not share the same commitment to or interest in cultural critique on which electronic arts, critical internet studies, or critical design practice are built, and their role in collaborative projects is often reduced to out- or insourcing of computational skills on a contingent, nonreciprocal basis. Moreover, at NTNU, purchases of hardware and software are always prioritized over investment in transdisciplinary critical *humanware*. Thus, *the way* in which powerful digital tools and platforms arrive in the humanities means also the stealth arrival of a particular form of collaborative practice, and promoting faith in the transparent and innately positive agency of technology. This, in turn, transforms the humanities toolbox but also displaces its few ethical methods practices in place that were laboriously fought for by artists, humanists, theorists, and designers since the middle of the previous century.

[16] Among these are Kunsthall Trondheim (a contemporary art gallery/center), Rockheim (Norway's national immersive museum of contemporary popular music), Trondheim Kunstmuseum (a fine-arts museum), Trondhjems Kunstforening (a contemporary art association and gallery in Trondheim), and Trøndelag Senter for Samtidskunst (the regional Center for Contemporary Art).

[17] See the full LEHALDP syllabus at https://www.asle.org/teaching_resources/environmental-humanities-transmedia-syllabus/. The TALS syllabus has yet to be included in the full text repository.

[18] For a detailed discussion of the class and the administrative challenges to inclusion work at NTNU, see Musiol (forthcoming 2021).

[19] Kunsthalls (art halls) are contemporary art institutions in Europe with an explicit community-engagement mission.

[20] Access barriers, especially for students with physical impairments, are always there. However, the fact that we could invite nondegree, unenrolled migrant participants to the initiative and reward them with an official NTNU certificate of attendance without fees or legal and bureaucratic barriers was a major achievement.

[21] Limits placed on who can participate in digital environments at an otherwise very *public* public university confirms what DH scholars and digital rights activists have been saying for a long time: new technology distributions and copyright law reinscribe, not fix, social inequality.

[22] Among the influential inspirations are a Futurescapes symposium in new media, technology, and the humanities, with exhibits and artist-led lecture sessions, including Kari Kraus's ARG participatory design workshops and her digital enchantment and decay work (2019) and Nancy Mauro-Flude's spectral-digital performance; and a subsequent Technology & Emotions conference co-organized by NTNU ARTEC with the Oslo-based Polyteknisk Forening (a national engineering association) and an *i/o* lab bioart curatorial collective from Stavanger.

[23] Note that as of 2018, some creative practices are now officially recognized as "artistic research," a form of knowledge-making and an academic field in Norway.

[24] For a discussion of new, transmodal tools and (as) postcolonial theory method in this and other NTNU initiatives, see Musiol (2020, forthcoming 2021).

[25] Moreover, our participants represented diverse fields and came from different administrative levels and functions in the university, cultural heritages, and urban ecosystems: we worked with students, senior scholars, junior and veteran artists, curators, DH guest-speakers, university-unaffiliated migrants, and high-powered administrators of academic or cultural institutions.

[26] All references to participants' public writing / blog work are cited in text only and used with permission.

[27] Ursula Le Guin, and other speculative fiction writers, is credited not only as a novelist but as an important environmental humanities thinker in Tsing et al. (2017) and in the documentary *Donna Haraway: Storytelling for Earth's Survival* (2017).

[28] Much radical recovery work aims to resist the destruction or concealment of cultural productions by colonial subjects, women, LGBTQI+ persons, or persons of color. See Bernstein (2011), Lowe (2015), Stoler (2010), and Jim Hubbard and Sarah Schulman in the ACT UP Oral History Project, for instance. This class acknowledged their work, but it engaged specifically with the absence of the nonhuman “voice” in cultural heritage archives.

[29] For a discussion of another nonhuman species extinction archival installation by Heldén and Jonson (2017), see Musiol (2020, 269–72).

[30] Each card displayed images of different bird species, and ornithological and cultural information about them — including poetry and other cultural lore associated with different migratory birds in the different regions through which they migrate.

[31] Many digital archives are participatory and crowdsourced. However, here the participation, while collective, was also corporeal, intimate, and individual first.

[32] Of course, our Norwegian students had different understandings of the objectivity of archives than did Indigenous Sámis or (im)migrant participants of our classes.

[33] Henry Mainsah contributed to the drafting of this section and led the workshops described herein.

[34] All commented on course blog on November 9, 2017.

[35] Prototyping Environmental Humanities Brief handout.

[36] Prototyping Environmental Humanities Brief handout.

[37] Prototyping Digital Humanities Brief handout.

[38] All were included in an anonymous DEH Discussion + Workshop Reflection assessment conducted between October 30 and 31, 2017; results are publicly available at NTNU.

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