

CHEMO CREATURES IN A DIGITAL OCEAN!

The Making of a Speculative Ecosystem

Lucy Sabin

Introduction

Sounds of the sea fill the expectant darkness of the gallery. A screen illuminates. The establishing shot depicts a rugged shoreline. Rock pools fringed with tendrils of macro-algae dominate the low angle shots, intimating a non-human perspective. Something here is “waiting” and “listening,” announces a large voice-over. The camera tracks forward, pulling the viewer into this amphibious geography. A roaring wave comes into focus. It engulfs the lens in a profusion of bubbles, then a calmer montage of drifting seaweed. The audio dampens, reminding bodies of the pressing weight of water on eardrums. Gradually, the location shooting dissolves into a Stygian, computer-generated simulation architected around porous rocks with crevices that glow eerily. Extreme close-ups reveal the sources of this luminescence: pulsating organisms crowned, like sea urchins, with shimmering spicules. These bottom feeders are, it transpires, grazing on a blackened bloom of algae, using its toxicity to paradoxically curb their volatile (cancerous) growth. Each specimen’s fluctuating mass is expressed as ephemeral dots of light set to a tinny diegetic score.

This chapter seeks to uncover the interdisciplinary and multimedia processes that are present in, yet exceed, the polished final work, *In Search of Chemozoa* (boredomresearch 2020a). What follows is a textual “making of,” or behind-the-scenes exposé. I have drawn primarily on an interview and follow-up correspondence with digital artists Vicky Isley and Paul Smith, known collectively as boredomresearch.

While tracing the evolution of the Chemozoa project, I examine the ways in which digital media are used by boredomresearch to set in motion an artistic experiment and affective space for rethinking health in more-than-human terms. First, in “Modelling and Making Worlds,” I outline how boredomresearch work with data in expressive ways that transcend the representational requirements of scientific modelling. Second, “A New Model Organism” homes in on the Chemozoa as an artistic approach to modelling cell behaviour (Posthumus and Sinclair 2014, 269). Third, “Restless Balance” is a meditation on the emergent and generative software effects that give each Chemozoa a complex and poetic relationship with their contaminated environment. The final section, “The Language of the Documentary,” analyses how cinematic conventions and innovations weave together organism and environment into a narrative form.

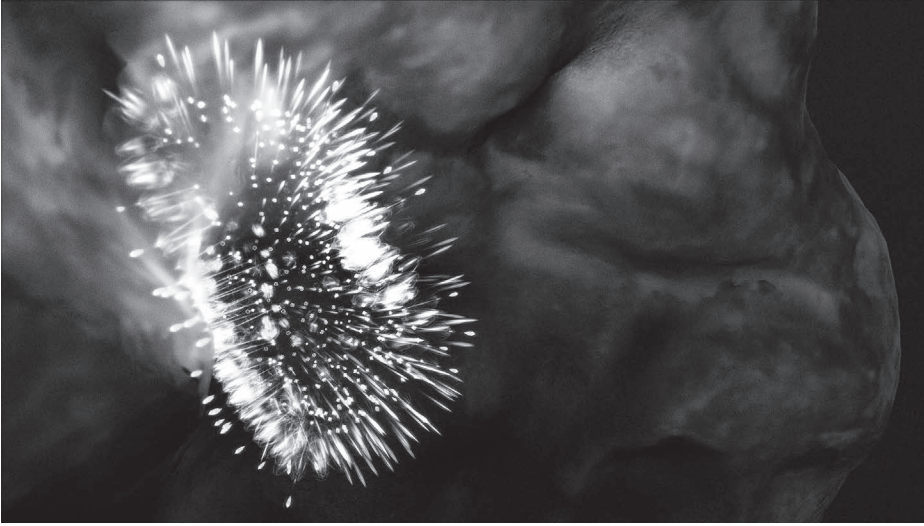


Figure 16.1 A Chemozoa on a rock. Still from *In Search of Chemozoa*.

Credit: boredomresearch, 2020

The following analysis seeks to foreground underlying processes of creative experimentation. As formative elements of the project, technological and aesthetic details are central to this ecology of ideas (Dixon, Hawkins, and Straughan 2012), along with other “embodied *practicalities* of knowing” (Despret 2013, 69, my emphasis). The aim is to indicate where digital modalities, environmental concerns, and the humanities might intersect in practice. So this chapter puts practice before theory as its rule of thumb; think of it as a process-oriented inquiry that attempts to make tacit knowledge available for further discussion. Salient themes of methodological relevance to the nexus of DEH include art-science collaborations, data modelling, affect, and more-than-human storytelling.

Modelling and Making Worlds

Arizona Cancer Evolution Center has an established “ArtSci” programme. Previous projects have aimed to explore cancer in novel ways using artistic methods. For instance, researchers in the Maley Lab, which investigates cancer in relation to evolutionary biology, have developed a software programme that generates musical dissonance to evoke cellular deviance. And former artist-in-residence, Susan Beiner, created intricate ceramic sculptures with repeated textures to emulate metastasis through tangible and three-dimensional forms. (Miniature “metastatised” replicas have been exhibited in different locations.) As these examples illustrate, the assemblage of media that an artist works within and through may, by virtue of material and aesthetic qualities, lend itself to unique ways of thinking about a less perceptible phenomenon.

Isley and Smith specialise in programming speculative ecosystems, and they use experimental combinations of “new media” to do so. Each of their projects proposes its own digital Anthropocene (Travis 2018) – in a non-anthropocentric way – wherein viral vectors and toxic exposures are played out in more-than-human fictions (e.g. boredomresearch 2016, 2018). These dynamic worlds, with their coded variables and biological themes, attempt to do what scientific test systems cannot: to



Figure 16.2 Environment shot of incoming waves. Still from *In Search of Chemozoa*.

Credit: boredomresearch, 2020

explore the semiotics of data modelling as an activity carried out by living, breathing researchers. While scientists are trained to streamline data to avoid any kind of messy entanglement that would render the output scientifically useless – that is, not directly comparable with other abstract results – boredomresearch proactively “look for the mess” (Isley, interview with author, December 17, 2021). By embracing states of entanglement (for want of a better word) as ontological co-dependence without flattening the specificity of each relation, boredomresearch incorporate into their digital worlds the kinds of dynamic dimensions that scientists might systematically discard or not have access to, such as landscapes, emotions, or speculative fictions (Haraway 2016).

Seeking out the discarded or overlooked details of scientific research is a step toward offering “something different from the science” but equally “robust” (Smith, interview with author, December 17, 2021). In this respect, boredomresearch differentiate between artistic and scientific ways of knowing. Both are fictions, by the way, that relate to “an idea of truth”, according to the artists. “And what does truth mean in a scientific context?” Smith questioned, “Is that the same idea as truth in an artistic context?” Speaking about a previous project, *AfterGlow* (boredomresearch 2016), a computer-generated real-time artwork about malaria transmission, he stated, “We wanted to capture the truth of the visual complexity of a disease like malaria as it would exist in a landscape if we were able to see that.” Being true for the artists is an additive as opposed to a subtractive empiricism (Latour 2016) that relates to the intuition of composition in aesthetics or the lesson in a fable. There is, simultaneously, profound resonance and openness of interpretation.

To make clear the distinction between representational models or data visualisations and their artistic worlds, boredomresearch refer to their work as “expressions.” The onus is on translating “the feeling more than the science” (Smith, *ibid.*). For example, feelings of melancholia seem to pervade throughout their oeuvre to date. Isley puts the melancholy down to the “fragility” of the natural systems they look at, as well as the unpredictability of software development, “You experience fragility when something can easily collapse or become noise, so when we’re

programming something, you see that emergent behaviour and then you experience loss, in a way” (on loss, see High 2021). Computer modelling is a mode of artistic expression here. And “if you’re creating an artistic expression of something, you must feel something” (Smith *ibid.*).

A New Model Organism

The Chemozoa are an artistic and affective expression of the analytic work taking place at ACE. The concepts for *In Search of Chemozoa* were developed gradually as the artists immersed themselves in the scientific context. By conducting exploratory interviews with the cancer researchers and being a “fly on the wall” in the laboratories, Isley and Smith absorbed ideas from the two interconnected laboratories at the Center: the Maley Lab (or evolutionary biology lab) and the Cooperation and Conflict Lab, where researchers use systems thinking from social psychology to examine why some cells work together while others appear to “cheat the system” (see Aktipis 2020). Before delving into the creation of the Chemozoa, I first outline a scientific concept and case study that were integral to the conceptualisation of this digital species.

Some of the scientific research at ACE involves observing a select group of invertebrates under different laboratory conditions to better understand their apparent resilience to cancer. The laboratory animals are model organisms; their tissues are recruited as part of a biological test system with potential insights for cancer care. Since the early 1900s, model organisms have traditionally denoted a reductive handful of species that now serve as empirical emblems for cell biology. Yet with the advent of new technologies that speed up gene sequencing, there is a resurgent enthusiasm to make, as it were, *new model organisms* on the basis of each species’ attributes, as opposed to any precedents for working with that species (e.g. Goldstein and King 2016; Russel et al. 2017). For example, researchers at ACE move between wet and dry labs to construct and study model organisms with elevated regenerative attributes.

Out of their own considerations of the scientists’ question, *how to live with cancer*, Isley and Smith developed a fictitious model organism – the Chemozoa – that lives *as cancer* (on the monsters of BioArt, see Dixon 2008). They describe the Chemozoa as the “digital nemesis” of the Placozoa (lit. “flat animal”), one of the model organisms at ACE, which has the simplest structure of all known animals. While the Placozoa is tested for its resilience to high-energy radiation (Fortunato et al. 2020), the Chemozoa has a cancerous mechanic programmed into its cells, each of which glows with the eery radiance of underwater nuclear reactors (Cherenkov effect). While the Placozoa has been extracted from a sample of algae to be observed under laboratory conditions, the Chemozoa heralds algal toxicity within an ocean habitat. As a speculative system for thinking and feeling with, the Chemozoa evinces artistic licence in its ability to imaginatively leap across scientifically uncharted territory and imagine otherwise.

Imagining otherwise extends to the digital milieu that boredomresearch built into a game engine, which is layered with under and above water location shooting in the video. The setting for the film seems to play upon the contrast between artificial laboratory conditions and the natural habitats of the Placozoa. The scientists’ attempts to replicate the latter in the wet lab tangentially inspired boredomresearch’s digital ocean habitat. To emulate “calm water areas with hard substrates like mangrove tree roots, rocks, corals” (Schleicherová et al. 2017), the scientists set up tanks with special aeration systems and rocks imported from Egypt, believed to contain a Goldilocks combination of minerals and microbes (boredomresearch 2020b). Correspondingly, craggy rocks are a leitmotif throughout boredomresearch’s experimental film; the artists scanned an actual rock and imported its textures into their virtual environment via photogrammetry (digital as opposed to physical importation). The rocks in *In Search of Chemozoa* take on a crucial significance in the narrative. Unlike the existing



Figure 16.3 Angelo Fortunato looking down a microscope. Still from *In Search of Chemozoa*.

Credit: boredomresearch, 2020

model organisms at the Center, Chemozoan cell regulation does not depend on capacities that a certain organism is believed to possess in isolation but on symbiotic dynamics that extend inextricably across this speculative ecosystem.

To then situate the organism within a recognisable environment while also simulating cell behaviour, it proved necessary to exaggerate the scale of the computerised organisms in relation to their setting. As Smith put it, “we wanted to create something that had screen presence, but a maximum cell count of about a thousand cells, so the cells had to be big!” (ibid.). Isley remedied that the exaggerated proportions turned out to be a benefit in the eyes of the scientists, who can only observe creatures like Placozoa under a microscope as opposed to in their natural habitat. This question of scale surfaces in a particular sequence of *In Search of Chemozoa* when a mid-shot of a scientist in a white lab coat peering into a microscope cuts to an ocean view framed by a peephole, connecting the microcosm with the macrocosm. In composing their own realm of experimentation, the artists overcame some of the scalar limitations faced by evolutionary biologists studying microorganisms.

At the Cancer Evolution Center, pragmatic questions such as “Which rocks and algae need to be in the tank to keep the Placozoa alive?” must be answered before scientists can begin to ask, “How do Placozoan cells protect against radiation?” Contrastingly, for boredomresearch, details about the constructed environment in which Placozoa are studied opened a world of possibilities. While the scientists were necessarily more concerned with controlling environmental conditions to produce a repeatable and comparable method for gathering reliable data, the artists delved into the messy entanglements between the research subject and its milieu. *In Search of Chemozoa* traces and probes relations rather than numbers. Freed from the pressures of science to design conditions with the objective of obtaining a categorical or numerical response (Stengers 2018, 62–63), the artists emphasise the chaotic complexities of organisms that recursively change and are changed by their environment. A frond of seaweed or a rock is never just that.



Figure 16.4 Close-up of Placozoa tank at ACE.

Credit: boredomresearch, 2019

Restless Balance

In Search of Chemozoa sets in motion a body–world relationship that analogises chemotherapy as well as more extensive rhythms of care and intensities of exposure within toxic environments. boredomresearch refer to this paradoxical state of dependence on toxicity as “restless balance”; the oxymoron became the title of their exhibition at the ASU Art Museum (5 December 2020–30 May 2021). Inspired by epidemiology and ecology, restless balance describes the dynamic continua between bodies and their worlds. The poetic phrase refers to seeking harmony in motion, “searching for some sense of stability but recognising change and the awkwardness that that creates” (Smith, *ibid.*). For the introduction label to the exhibition at ASU, Isley and Smith wrote,

With the first recognition by Hippocrates that human health is subject to environmental factors we now find ourselves increasingly conscious of a destabilised natural order. Aware that our own actions are contrary to those that improve our position, a desire for an increasingly elusive solid ground, sought as an essential basis for stability, has become a restless pursuit for balance. . . . To be sought but never found.

Chemozoa embody restless balance. The pullulating mobilities of their cellular communities “lit up like Christmas lights” evoke the micro-cinematographic aesthetic of live-cell imaging (Landecker 2013). Encoded inside a game engine before being captured with a wide-angle lens, each organism’s cellular reproduction and death are visible as emergent effects relating to their feeding habits; “as they’re feeding, they’ll grow bigger but, also, you’ll see this mechanism of apoptosis. Then the Chemozoa shrink” (Isley, *ibid.*). The Chemozoa rely on “toxic algae” in

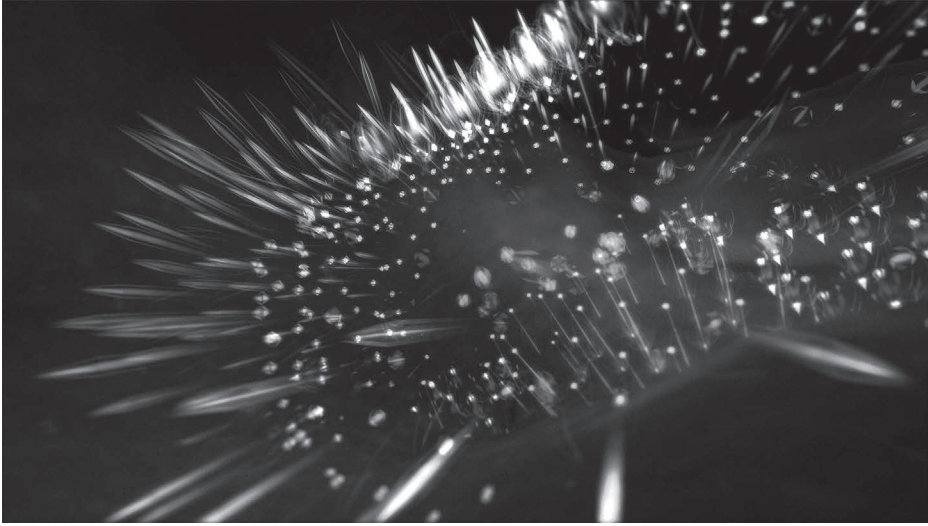


Figure 16.5 Extreme close-up of Chemozoan “cells,” including the red dots of toxic algae. Still from *In Search of Chemozoa*.

Credit: boredomresearch, 2020

their environment for curbing their growth. Survival requires a recursive rhythm of carefully timed doses of algae to “manage the divergent clones” in their cell tissue (Smith, *ibid.*). These exposures are integral to the organism’s metabolic and reproductive cycles (on toxicity as “distributed reproduction,” see Murphy 2013). When ingested, the algae become an endosymbiotic nucleus of fiery embers inside the body of each organism.

The Chemozoa are “effectively giving themselves their own chemo dosage” (Isley, *ibid.*). Relying on these calculated exposures performs the almost paradoxical logic of chemotherapies: treating with a poison that also cures in certain concentrations (Stengers, discussed in Kirksey 2017). Chemozoan behaviour enacts chemotherapy by restlessly balancing relative toxicities, relative presuppositions of harm caused by a substance when encountered by a body. This tension is reinforced by the oxymorons that pepper the voice-over description: “harvesting a *bittersweet* coating of *nutritious contamination*,” these beings are “*stillness in motion . . . progression arrested . . . searching without advance or resolution*” (boredomresearch 2020a; my emphasis). Chemozoan chemotherapy is timed, but it also exists outside linear time. There is no life without cell death.

In boredomresearch’s biomedical imaginary, the trials and tribulations of chemotherapy are not a drastic attempt to obliterate abnormalities. *In Search of Cheomzoa* is not a depiction of an all or nothing “fight” against cancer (Sontag 1983 [1978]). Nor are the doses based on abstract measurements. This is a story about *adapting to* and *living via* toxicity through embodied knowledge of the environment. The analogy of chemotherapy is thus extended to encompass notions of environmental health, from one “chemical regime” to another (Murphy 2008). Shifting the dominant narrative of illness from the individual body to its relations with the environment, the Chemozoa debunk persistent myths of purity or immunity in worlds of ubiquitous (yet unevenly distributed) carcinogenic, endocrine-, and metabolic-disrupting chemicals (see Barry 2017; Romero et al. 2017; Shapiro and Kirksey 2017).

During research and development, boredomresearch investigated how blooms of micro-algae, provoked by climate change and anthropogenic run-off, lead to low-oxygen dead zones

(boredomresearch, e-mail to author, 22 March 2021). In the film, the “sickening algae” first materialises as an inky plume, carrying with it the loaded symbolism of an oil spill at sea. The blackened bloom is a harbinger of the Chemozoa, ocean wanderers who go in search of toxic tides. “Queer survivors” (Murphy 2013) of late industrial pollution, their bodies have made bioavailable the toxicants that persist and bioaccumulate in their food chain. Through harvesting the blooms, then, the Chemozoa are agents of bioremediation, restlessly balancing their own health with that of their environment. Care in a “permanently polluted world” is an everyday chore, never finished (Liboiron, Tironi, and Calvillo 2018).

The Language of the Documentary

In order to mobilise care and curiosity, boredomresearch have used filmmaking conventions to bring together the ideas covered throughout this chapter in a “low resistance way” (Smith, *ibid.*). In particular, the artists were inspired by the genre of documentary filmmaking, the conventions of which have historically mixed and blurred scientific and artistic knowledge and techniques. During our interview, the artists volunteered that they followed certain conventions from the “familiar language of the documentary such as the establishing shot, where you establish an idea of a location and then you have a journey that takes you from an idea of a place to a particular kind of situation in that place.” In this sense, the use of landscape “made itself necessary” by giving context to a “situation where we can experience a creature and have an introduction” (Smith, *ibid.*, see also Haraway’s “situated knowledges,” 1988).

While the above-water opening scene was shot on location in Asturias, Northern Spain, and the underwater shots of turbidity were filmed in Mar Menor Lagoon, Murcia, Southern Spain (where the artists researched toxic algae), the scenes in which we encounter the Chemozoa are computer-generated animations built with game engine software. The compositing between landscape and digital models feels seamless in the final cut, thanks to the sense of going on a journey, hence the title of the artwork. As Isley put it, “every camera angle transports you further in this search.” Accordingly, “the [digital] environment was set up with certain shots in mind, such as panning around a rock to see the Chemozoa.” An element of chaos, due to the generative nature of the animation as it renders in real time (during production), made this search feel more real to the artists; sometimes, a Chemozoa would ignore its cue to stay next to the rock! Isley and Smith experienced “weird moments” like this during production; “we felt as though we were out in nature, trying to document these beings” (Isley, *ibid.*).

In our interview, boredomresearch were resistant to labels such as science fiction. They were also reluctant to call *In Search of Chemozoa* a pseudo-documentary, even though this term has been used in internal and external communications by commissioners and curators. Limitations of labels notwithstanding, perhaps there might be a parallel to tentatively draw between this digital artwork and the emerging genre of the speculative documentary, which embraces “perpetual uncertainty, contamination, contestation, befoggedness and messiness” in its “engagement with, and . . . creation of, multiple and mutable realities” (Dienderen et al. 2019). A heterogeneous genre, the speculative documentary resembles the “design fiction” (Dunne and Raby 2013, 89–100) in its use of familiar signifiers to build plausibility, allowing the audience to contemplate a slightly altered reality. So, when the otherworldly Chemozoans appear and the location-based cinematography shifts to *in silico*, the embodied viewer enters into a fabulated world that is framed within more recognisable coordinates.

As Jamie Lorimer holds, “moving images *should* open thinking spaces for a micro-politics of curiosity in which we remain unsure as to what bodies and images might yet become” (2015, 138; my italics). Lorimer claims that such experimental media are led by a “logic of curiosity,”



Figure 16.6 Oblique close-up of the custom-labelled keyboard that boredomresearch used for producing *In Search of Chemozoa*.

Credit: boredomresearch, 2020

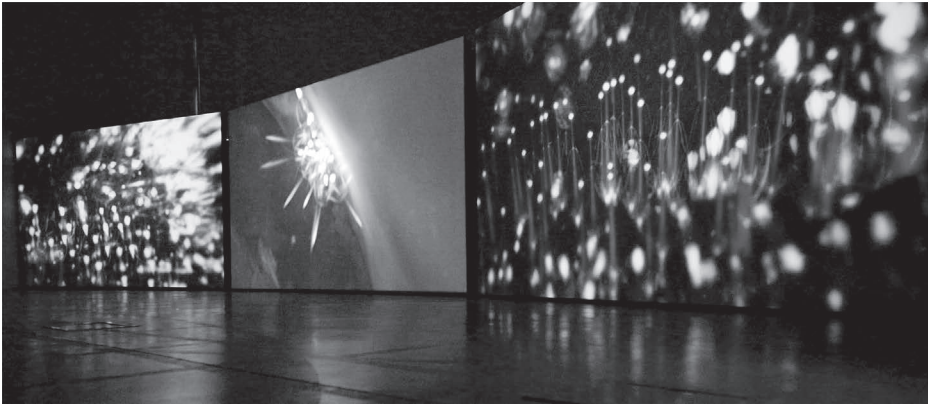


Figure 16.7 Multi-channel video installation at Aspex Gallery. All three screens show different views of *Chemozoa*.

Credit: boredomresearch, 2021

enlisting the surrealist wildlife documentary, postmodern animal art, and experimental video (133). *In Search of Chemozoa* certainly calls into question the mainstream experience of viewing nature on screen, perhaps more through the curiosity of artistic experimentation than an obligation for the filmmakers to open a particular “thinking space.” This disruption is partly achieved by the cyclical format of the screenplay, which rolls backwards and forwards as the camera bobs in and out of the water; the 13-minute video is designed to be watched from any point in its

loop so passers-by in the gallery can join at any stage. This downplaying of beginning and end reinforces the idea that we are seeing an ecosystem *in media res*. There is no certainty as to what bodies and images might yet become because they are perpetually becoming.

The amphibious camerawork and non-linear editing of *In Search of Chemozoa* piques curiosity in a manner reminiscent of Jean Painlevé's surrealist wildlife documentaries of the mid 20th Century (see Lorimer 2015, 133–34). Viewed within the history of underwater exposés, *In Search of Chemozoa* is part of an historical tradition of using technological innovations to mediatise the ocean as a volumetric setting for dramatic happenings (Cohen 2019). As media theorist Nicole Starosielski observes, the way we visualise the ocean is of increasing importance, being rooted in socio-historical contexts, which often involve exploitation and inequity (2012). Present in our biological makeup, watery media spawn an imaginary space for uncanny encounters with ourselves, including our evolutionary and maternal origins (Neimanis 2016). Plunging into the sea, physically or imaginatively, allows us to viscerally relive the interiority and interfaces of bodies, tissues, and cells (see Jue on Cousteau 2020, 34–70), as well as naturecultures writ large. Intimacy and vastness co-exist here.

The voice-over guides this quest to find Chemozoa, all the while inviting audiences to perhaps reflect upon their own embodiment and the worlds in which they participate. The cyclical script for the voice-over brings together elements of interviews that boredomresearch conducted with over 20 scientists, creating a collective narrative. In transposing these insights, Isley and Smith chose to use poetic rather than scientific language “to capture some of the rich emotional value that both underlies and motivates the research” (boredomresearch, *ibid.*). So while the commentary follows the wildlife documentary convention of being off-screen and therefore disembodied, the script is received less as a master narrative from a position of disconnected omniscience and more as a fable being passed on with care. Voice-over artist Lara Parmiani was directed to perform “with weariness and pausing for reflection,” to “seem wise but without . . . any sense of superiority,” and “to have a touch of melancholy and fragility, at times overcome by a fascination and subtle joy with the curious nature of the world” (boredomresearch, *ibid.*)



Figure 16.8 Making a field recording for *In Search of Chemozoa* by River Test, Southampton, UK.

Credit: boredomresearch, 2020

To capture oceanic sounds, boredomresearch made multi-sited field recordings with a hydrophone in the UK and Spain. Making the “voice” of the Chemozoa was less straightforward. It involved elaborating on the backstory of their speculative organism. Initially, Isley and Smith held many conversations with scientists both at the Arizona Cancer and Evolution Center and at Barts Cancer Institute in the UK about “trying to find a way to sonify an organism as though we could hear its cells and maybe the chemical signalling” (ibid.). As inspiration, the artists referenced the Hyena project at the Maley Lab, where researchers are “working on giving music cancer” by “trying to . . . recreate the mechanics of cancer within a piece of music” (Smith, ibid.). The Hyena application analogises musicians in a symphony to the cells of a body, “working together to produce a living, breathing person.”¹

In a similar vein, the voice of the Chemozoa became, in itself, an artistic exercise in simulating cancer and interpreting data artistically. Towards the end of the production process, the artists developed a library of both acoustic and synthesised sounds that might respond to each stage in a specimen’s development. From a delicate ticking to sirenic song, Isley and Smith classified the sounds according to their “level of discord” and “complexity of energy,” which were matched to the visual content and composition of each shot. The soundscape immerses audiences in this digital ecosystem. At one crescendo, when “more mature” Chemozoa are crowding around a centre-framed rock, “the sound is more electrical and charged as if they are processing their environment on an almost industrial level” (boredomresearch, ibid.). The soundtrack’s blend of digital and analogue, machinic and creaturely sounds, is a musical analogy for not just cellular health but also the hybrid concept of biotechnology itself.

Conclusion

Having traced the evolution of this experimental film, I dwell here on two insights that have emerged from this practice-based analysis. First, I briefly suggest an extra-disciplinary approach that might be described beyond the particulars of this project as *art at the ends of science*. By “ends” or “edges,” I mean that which lies outside certainty, as well as the limitations that are associated with scientific methods in constructing what is presumed to be known. The world that boredomresearch set in motion began with questions about the constructed nature of scientific frameworks. The work of scientists presented edges in the eyes of the artists that spliced open possibilities for subversive imaginaries with multiple interpretations and affective relations. boredomresearch saw how scientists made model organisms, and they experimented with their own speculative, digital version to star in an alternative narrative: a poetic, dynamic, and normalised account of living as cancer.

Second, I close on the need to *document methods* across the digital environmental arts to better understand the processual evolution of ecological imaginaries as they emerge from a particular context. The trans- or post-disciplinary labour described previously was essential to the digital arts methods developed by boredomresearch for this project. New media techniques were innovated to express *the feeling more than the science*. Analysed together, these methods accumulatively propose a digital ecology that interweaves arts and sciences, wetware and soft/hardware, rocks and life, human and non-human (Posthumus and Sinclair 2014, 270). In so doing, the film invites audiences to expand and de-compartmentalise environmental and medical imaginaries towards a future-oriented “critical posthumanities” (see Neimanis, Åsberg, and Hedrén 2015). *In Search of Chemozoa* is a quest, after all. The journey in the film, from the familiarity of the shoreline to the depths of the digital ocean, analogises the evolution of the project itself, as well as an urgent move towards narrating queer ecological relations.

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Note

1 <https://cancer-insights.asu.edu/2020/05/capturing-cancer-with-music/>.

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