Wild Blue Media: Thinking Through Seawater

by

Melody Christina Jue

Graduate Program in Literature
Duke University

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Approved:

Mark B. N. Hansen, Co-Supervisor

N. Katherine Hayles, Co-Supervisor

Rey Chow

Priscilla Wald

Dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Graduate Program in Literature in the Graduate School of Duke University

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ABSTRACT

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Abstract

Dwelling with the alterity of the deep sea, my dissertation, *Wild Blue Media: Thinking Through Seawater*, considers how the ocean environment produces cognitively estranging conditions for conceptualizing media and media theory. Concepts in media theory have thus far exhibited what I call a “terrestrial bias,” theorizing primarily dry technologies through a language whose metaphors have developed through human lives lived on land, rather than in the volume of the sea. In order to better understand the “terrestrial bias” in media theory, I develop a critical method of “conceptual displacement” that involves submerging key concepts in media theory underwater, engaging both literary texts and digital media. Specifically, I turn to Vilém Flusser’s speculative fiction text *Vampyroteuthis Infernalis* to rethink “inscription”; ocean data visualizations to rethink “database”; and Jacques Cousteau’s diving narratives to rethink “interface.” Focusing on the ocean expands the critical discussion of the relation between embodiment and knowledge taken up by feminist science studies, and necessitates the inclusion of the *environmental conditions* for knowing; our milieu determines the possibilities of our media, and the way that we theorize our media in language. The ocean thus serves as an epistemic environment for thought that estranges us from our terrestrial habits of perception and ways of speaking about media, providing an important check on the limits of theory and terrestrial knowledge production, compelling us to have the humility to continually try to see—and describe—differently.

Turning to the ocean to rethink concepts in media theory makes apparent the interrelation between technology, desire, ecology, and the survival of human communities. While media theory has long been oriented toward preservation and cultural contexts of recording, studying media in ocean contexts requires that we consider conditions that are necessarily but contingently
ephemeral. Yet to engage with the ephemeral is also to engage with issues of mortality and the desire towards preservation—of what we want to remain—a question that especially haunts coastal communities vulnerable to sea-level rise. What the ocean teaches us, then, is to reflect on what we want our media technologies to do, as well as the epistemological question of how we are habituated to see and perceive. By considering the ocean as a medium and as an estranging milieu for reconsidering media concepts, I argue for an expanded definition of “media” that accounts for the technicity of natural elements, considering how media futures are not only a matter of new digital innovations, but fundamentally imbricated with the archaic materiality of the analog.
Dedication

To my teachers, in and out of the water.
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From this day forward we would swim across miles of country no man had known, free and level, with our flesh feeling what the fish scales know.

- Jacques Cousteau, *The Silent World*

If media theory concerns the different sense ratios through which mind interacts with world and the various worlds that come into being in distinct historical and ecological climates, the ocean should be of primary interest as an environment that invites us landlubbing bipedals to abandon most everything we take for granted. The marine world invites fundamental anthropological questions.

- John Durham Peters, *The Marvelous Clouds*

Location is the always partial, always finite, always fraught play of foreground and background, text and context, that constitutes critical inquiry. Above all, location is not self-evident or transparent.

- Donna Haraway, *Modest_Witness@Second_Millenium*
Prologue: Scuba Diving as Critical Praxis

Before I began writing *Wild Blue Media*, I decided that it was necessary to leave the safety of my desk and spend a quality amount of time underwater by learning how to SCUBA dive.¹ For if I was to argue that the materiality of seawater changes how we understand media, then surely second-hand accounts of the ocean environment would not suffice. I would need to let the ocean work on me by spending more time immersed in its depths, open to the challenges and estrangements of breathing underwater. Although the cultivation of such a practice draws clear parallels with anthropology and ethnographic writing—of the participant-observer who accounts for her own interactions with their foreign subjects of study—I found that diving required me to revive and recall memories and observations differently. What I mean by this is that ethnography tends to proceed by a series of interviews, verbal exchanges, and observations of relationships, such that the ethnographer begins to tease out and weave narrative threads into a complex story. Yet when I began diving, I found that I had difficulty with linearity: memories from each dive come back to me dream-like, not as a coherent and verbalized tale of “what happened,” but as flashes of scenes that would unfold by first remembering the position of my body and how I felt. For example, remembering a diving the near-shore kelp forests in Monterey, CA has to start with the feeling of thickness of wearing two wetsuits for warmth, the regular surge of the waves above, swimming horizontally, and the rhythm of my breathing. Of course, ethnographers in Mali or Nepal might also recall environmental factors like extreme heat or cold with their observations; but what I wish to point out is that something about memory-formation changes underwater.

¹ Three PADI courses and two summer research grants later, I am on my way to becoming a better citizen of the sea, convinced that the ocean environment changes how we think about concepts. I have a modest 35 dives under my weightbelt but am still a beginner; most professional (dive masters) who take people diving for a living are in the water multiple times a week, totaling hundreds to thousands of dives over their careers. PADI, or the Professional Association of Diving Instructors, is one of the world-wide companies that safely trains new divers.
Indeed, I am hesitant to call my memories of dives “flashes” because I cannot recall a dive visually to explain what something looked like without recalling all the feelings of motion that coalesced in that moment. Remembering a dive is much like the fleeting memory of a dance sequence that you only ran through one time: you have a sense of how you were, but not exactly, and not in so many words. And of course there is the additional challenge that you can only ever write about diving after the fact, when you are no longer in the element that you are attempting to describe. Oceanic alterity changes how you observe and recall: it does not simply hold up strange creatures for you to theorize, it shifts your sensibilities. Or as John Durham Peters has put it, remarking on dolphin sonar in place of vision as an aquatic adaptation: “The sea is a natural laboratory for altered sense ratios.”

In developing *Wild Blue Media*, I have approached scuba diving as both an epistemological pre-condition for writing—bringing home the lessons from feminist science studies about the situatedness of knowledge—and as a skill-set that has allowed me to study art (Jason de Caires Taylor’s “Underwater Museum” in Chapter 1) and interpret literature (Jacques Cousteau’s *The Silent World* in Chapter 4) in ways that would otherwise not be accessible to me. For example, the ability to dive Taylor’s “Underwater Museum” in person enabled me to conduct a comparative study of the work’s existence across media forms, and importantly, prompted questions about visualization that might not otherwise come to my attention. The fact that I dove the museum under hazier conditions than were shown in Taylor’s photographs of the museum completely changed my experience of it, and made me realize just how object-focused rather than milieu-focused Taylor’s photographs were, treating seawater invisibly despite the fact that seawater is the substance or element that makes possible the very transformations he wants to

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showcase. In Chapter 4, I was better able to understand what Cousteau was saying about human physiology when breathing pressurized air and descending deep underwater because I had taken advanced dive training through PADI (Professional Association of Diving Instructors). This familiarity with the conditions Cousteau described contributed to my interpretation of his writings: that diving underwater is not simply a matter of becoming amphibious, and going freely underwater however long one wants. In fact, the longer you breathe pressurized air underwater, the more time you need to wait and “decompress” at 15 feet below the surface so that you can finish exhaling all the extra gas you absorbed into your body. In other words, you become alienated from the land in the very process of becoming able to breathe comfortably deep underwater, and have to spend time reversing that process to go safely back to sea-level elevation. Had I not had this understanding from experience, I would have taken Cousteau at his word that he and his comrades were amphibious “menfish,” rather than attending to the gradual process of terrestrial exclusion that happens in diving—this being important to how we understand the interface of the human body not only as a site of control and empowerment, but as a site of risk and openness between body and environment.

As a point of entry into rethinking the conditions of mediation in underwater worlds, I would like to relate my experience diving the Dos Ojos and Dreamgate cenotes (underwater cavern systems) in Tulum, Mexico. This narrative is, of course, the reanimated version of several stray fronds of kinesthetic memory that I had to patiently rehydrate and arrange before showcasing them in the aquarium of discourse. Yet I hope that it serves as a generative example of how I have been thinking about mediation: how aquatic environments ask us to rethink the material imagination that underlies the valuations and assumptions in our media concepts.

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3 This research was supported by a Summer Research Fellowship from Duke University in 2014.
As I researched additional diving sites that were near Jason deCaires Taylor’s “Underwater Museum” in Cancun, Mexico, which I had planned to research in July 2014 as part of Chapter 1, I became curious about the Yucatan cenotes. Nestled in the coastal forest, cenotes naturally occur when water courses underground through limestone; cavern openings form when the roof collapses in, enabling diving access. The limestone structures inside these freshwater caverns slowly change over time, offering natural “museum-like” conditions of visitation and preservation of human cultural material. As one scholar writes, the natural conditions of cenotes, “make for good conservation of palaeontological and cultural material” because of the cool water temperature (~ 25° C). “A young cenote with little incidence of light is naturally even better for conservation as it inhibits the development of micro-organisms.”4 Cenotes also had great mythical significance in Mayan culture as sources of freshwater and sites of communion with the underworld and heavens. Browsing a few photographs online had me hooked: the clarity of the freshwater cenotes was stunning, filtering down and refracting crystal-blue light from what looked like occasional openings above the caverns. What I would discover is that these conditions afford a variety of optical effects; media in the caverns would not be what I was expecting.

To get to Dos Ojos, my diving guide Rigo drove myself and three other divers (the limit that one divemaster can take for safety) down a long highway between Playa del Carmen and Tulum that parallels the coast, where there were many turnoff signs pointing to the locations of different cenotes. After making our exit, we drove down a long, bumpy dirt road before arriving at a larger parking lot with large cement tables available for helping to assemble and put on dive gear. Rigo spent a good twenty minutes going over safety procedures. These ranged from flashlight protocol, to how to alert him to a problem, to the safe distance to keep between oneself

4 Luis Alberto Martos López (2008), 108.
and the other divers/floor/ceiling, to how to enter the water from the entrance platform, and how to kick properly. Cavern diving is classified as “technical” diving because it requires much more precise buoyancy control and a special fin-kick that slowly propels you forward without kicking up sediment. This is extremely important for both the safety and the pleasure of the dive, because reduced visibility can obscure your ability to navigate.\(^5\) When not obscured, the natural clarity of cenotes like *Dos Ojos* is in the range of 200-300 feet, which visually is like looking through air or very clear glass.\(^6\)

\[\text{Figure 1: Melody Jue, Entrance to “Dreamgate” cenote.}\]

\(^5\) I have an example of the fin kick used in cavern diving on my professional website, [http://melodyjue.info](http://melodyjue.info), under “Research diving in Mexico,” as demonstrated by my instructor, Rigo.

\(^6\) In contrast, diving off the coast of Cancun had visibility around 35 feet, which is considered decent for the ocean, although deeper ocean waters can have visibility exceeding 100 feet.
After our briefing, we each picked up our thirty pounds of gear and walked down a very long, very steep staircase to the cavern entrance—an open blue maw, somewhere between a mouth and an eye, or an azure looking glass. Half of the pool was open to the air, and the side facing us was covered by a steep overhanging hillside. When I finally jumped in with my hot, heavy gear on—it was July in the Caribbean—I opened my eyes to pleasantly cold conditions, and a few small fish approached my mask. I looked around as if through blue tinted water, clear as air. Rigo gathered us at one end of the pool, gesturing to the entrance to the rest of the caverns below our feet. *Oh boy,* I thought, *here we go.* As we slowly sank, deflating our vests and adjusting to neutral buoyancy, we head towards a small dark tunnel that opened up into the base of a sloped, giant room of water with light streaming down from the high ceiling. We hung suspended at the dark bottom, gazing up to boulders and cathedral-like light. I realized that I wasn’t afraid.7

What I immediately liked about diving the caverns—which began to feel like journeying back in time—were the entry requirements of visitation. To enter the caverns, you needed to become temporarily transhuman, bringing your own prosthetics of air supply, wetsuit, technology, flashlight. The cyborgian entry requirements of visiting demonstrate one of the key lessons of feminist science studies and the Heisenberg Uncertainty Principle: that the presence of the observer affects the observed. The need to adjust my buoyancy created conditions of constant responsivity between my body and the surrounding environment, demanding constant attention so as not to disturb or hit any sediment, limestone structures, or other divers. Unlike diving in the open ocean, diving *Dos Ojos* required much more control over buoyancy and speed. With boat

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7 Reflecting on this later, especially my initial fear of diving in the dark, I realized that for me it is far easier to fear something from looking at a picture and guessing, than actually trying it out in person. In person you can measure your body, technology, and mobility against the real situation and conditions of immersion, gaining confidence from the fact that your gear works and that you’ve triple checked your tanks, regulator, and gauges. I felt that my body was a measure, the test against which I knew if I was safe or if something was wrong.
diving, the emphasis is usually on a quick descent from ship to seafloor, and a casual but occasionally rapid pace of swimming. Further, because the floor and depth of water do not change, you only need to adjust your BCD (buoyancy control device) to be neutrally buoyant in the water one or two times. Yet in the cenotes, we had to slow down our swimming speed so as not to run into a group ahead of us. The terrain also changed, sometimes as deep as 40 feet and sometimes as shallow as 10 feet. This required that we make small adjustments to our buoyancy (through inflating or deflating our vests) throughout the dive, aware to not drift out of control either upwards or downwards. Just like in outer space, you do not want to move or inflate anything too quickly, because the motion is amplified and you will overdo what you attempt. The stakes of good buoyancy control had to do with respect for the environment and other divers: we did not want to damage any of the limestone structures on the ceiling or floor, nor stir up sediment through an unplanned landing. Diving Dos Ojos felt, at times, like an obstacle course or video game because of the way we constantly negotiated, in slow motion, the changing terrain and depths without hitting anything. In fact, my instructor Rigo told me that the “Temple of Doom” cenote was named after the video game Doom, not the Indiana Jones movie. This need for constant attention and self-monitoring of the body greatly distinguished the experience of diving Dos Ojos from open water diving, to the point where diving in the ocean felt almost reckless and imprecise after the challenge of diving a cenote; much like the practice of yoga, one must exercise careful breath control to perform slow movements.

Between the coolness of the water and the prohibition on touching the surrounding limestone, the cenote also felt like a museum. As we swam, guided by a thin rope line marking the path, I noticed that part of the limestone formations along our path were dulled—likely by careless divers. Fortunately the limestone columns that adorned the surrounding open caverns were untouched, thousands of years in the making. Stalactites and stalagmites had slowly dripped
into existence, sustained by the surrounding water, a kind of calcified residue of past ages. Although it almost felt like the cavern was a snapshot of the past, it was in fact very much alive, the limestone structures still growing amongst a few small fish. If the cenotes are an archive of the past, then they are a living archive that requires us to think about a watery vocabulary of media beyond inscription, accounting for mineral growth and the dripped formations of limestone. Even the fossils that we encountered—a snail, perhaps the fanned bodies of a crinoids—might be considered not as inscriptions, but as residues of past coral reefs, which Rigo said existed before the last ice age. Although the cavern was freshwater, the sea was very much present.

Figure 2: Melody Jue, *Pre-ice age fossils inside “Dos Ojos” cenote.*
Medial concepts of inscription and “trace” seemed, to me, to be inadequate to describe not only the limestone structures, but also what was happening with our bubbles. Along the tighter passages we swam in with low ceilings, you could see small pockets of air that had pooled together. It took me awhile to realize that these small pools of air were not “natural” but were, in fact, the exhalations of past divers collecting at the roof. These bodily exteriorizations of air produced a variety of optical phenomena: sometimes they looked like liquid mercury, sometimes like solid rock, sometimes like a mirror, sometimes transparent. During our dive, I would sometimes hear a thunderous “boom” that sounded like a large truck was driving overhead. When I asked my instructor Rigo about this later, he said that the “boom” was actually the effect of bubbles pooling together and flowing to the surface—“raining up” rather than down, an inversion of how we normally think of the movement of fluids. In addition to occasional scratches or stalagmite breakages—understandable as inscriptions—divers had left a residue of bubbles on the cavern ceiling. It occurred to me that this kind of scene was something that Peter Sloterdijk, after all his writings on bubbles, could never dream of from his desk. My air bubbles pooling at the ceiling constituted an ephemeral residue that, upon reaching a critical mass, would “pop” and overflow to the sky, producing a booming sound effects that future divers would hear—an affective delay. The air bubbles we left in the caverns was part of their material historicity, but not the substance that media theory typically considers as “media.”

8 Sloterdijk has extensively philosophized about bubbles in his Sphären trilogy, which moves from self (bubble) to world (globe) to plurality (foam). If the crisis of modernity is its “shellessness,” then “an inquiry into our location is more productive than ever, as it examines the place that humans create in order to have somewhere they can appear as those who they are. Here, following a venerable tradition, this place bears the name ‘sphere.’ The sphere is the interior, disclosed, shared real inhabited by humans—in so far as they succeed in becoming humans.” Bubbles, (Cambridge: Semoiexte, 2011) pp. 28. 9 For scholars that discuss a more expanded and non-Anthropocentric sense of elemental media, see Peters (forthcoming), Parikka (2014), Menely (2014), and Taylor (2014).
The second cenote that I dove, *Dreamgate*, was famous for having even more impressive limestone structures, and for being much darker and narrower. Yet the reason I was interested in the dive was because it featured a halocline, or border between fresh and saltwater. Most cenotes in the Yucatan are freshwater, but a few subterraneanly connect to the ocean and thus have a layer of heavier saltwater at the bottom. When I shined my flashlight on it, the border of halocline shimmered, looking paradoxically like an underwater river—a moving surface within the depths of the underwater cavern.\(^\text{10}\) During lunch in between dives, Rigo surprised me with a question: “If you were James Cameron, how would you film the halocline?” Our conversation had turned to science fiction films and deep sea exploration, and Rigo—who lead dives to cenotes probably four or five times per week—responded, “I think I would film the halocline in a film about traveling to other dimensions.” What struck me about this comment was not just that it proposed a compelling idea for a new novel or movie, or provided yet another link between the alien ocean and science fiction. Rather, instead of opposing land and ocean, Rigo’s comment compared the experience of *two kinds of water*, and their palpable differences. Not only does cenote diving feel like a descent into another dimension; within the caverns, one can still pass into yet more dimensions through encountering new bodies of water.

It struck me that this material example—of an interface between two types of water, or of a surface *underwater*—had not yet, anywhere, entered the ongoing conversations in literary theory on surface reading versus depth reading.\(^\text{11}\) The spatial metaphor that continues to structure those debates is one in which *there is only one surface*, and where the human observer is the one looking “at” the surface “down” into the depths, rather than possibly beginning from the depths—

\(^{10}\) This made me extremely disappointed that I had not made time to dive Angelita, a cenote further away that had an even more dramatic and sulfurous yellow halocline that in photographs appeared like fog, obscuring parts of trees and divers.

\(^{11}\) Best and Marcus  (2009).
or dealing with multiple surfaces within the depths. What I am learning from diving—what diving sensitizes us to—is the prevalence of spatial metaphors based on human observers standing on land, and how these continue to shape critical inquiry. This realization offers us a new way to approach debates in critical theory. The ocean, with surfaces existing within depths, offers an alternate environment to our familiar terrestrial landscapes whose spatiality and materiality might jar us into rethinking the orientations of literary theory, and indeed, media theory—of the interface as more than a surface, of the archive or database as mobile and transient, of inscription giving way to residues and saturation—of, essentially, a fundamental reexamination of the underlying environmental poetics and metaphors of our concepts and theoretical positions. Let us begin by looking back up to the sky from the entrance of the “Dreamgate” cenote (Fig. 3), through the mediating lens of the surface waters swirled with jungle dust and pollen, testing out the water of new epistemic environments.

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12 I discuss this debate at length in an article called “Churning Up the Depths” in Green Planets: Ecology and Science Fiction, Jue (2014).
Figure 3: Melody Jue, *Looking at the surface from within the “Dreamgate” cenote.*
1. Reading the Ocean as a Medium

1.1 Glaucus and Plato

For too long the landscapes of critical theory have been rather dry, primarily engaging the deserts of the real. Such nomadic theory has occasionally dipped in the oases of Heraclitian flux, sipped the wine of the creative unconscious, or dreamed of what it is like to be a blind leathery bat. Yet for the most part, critical theory has not dared to imagine Cthulian tales submerged beneath prehistoric seas, where oceanic conditions of living would make it much more difficult to abstract the fiction of Cartesian space (as if we could agree upon the ocean’s internal boundaries—as if we could separate milieu from other life forms).¹ Were critical theory to venture to the ocean, it would find it difficult if not impossible to speak without reference to the terrestrial earth that it has taken as the ground for the real, an unreflective terrestrial bias of thought.

Instead of going to roast marshmallows around the Plantonic campfire, let’s follow Plato to a less ideal landscape that has been largely… overshadowed… by the famous cave allegory from Book X of The Republic. After discussing ideal forms, Plato proceeds to consider that the human must also have something like an ideal Form, or immortal soul, through a dialogue between Socrates and the inquisitive character Glaucon.² Socrates explains the difficulty of knowing the primary nature of the immortal soul by recourse to the condition of the sea god Glaucus, whose body is constantly changing and modified by existence underwater:

[The soul] is like that of the sea god Glaucus, whose primary nature can’t easily be made out by those who catch glimpses of him. Some of the original parts have been broken off,
others have been crushed, and his whole body has been maimed by the waves and by the shells, seaweeds, and stones that have attached themselves to him, so that he looks more like a wild animal than his natural self.³

The sea god Glaucus—whose name gives us the modern term “glaucoma,” referring to the greenish-grey haze of the ocean—can only be known partially, opaquely, obscurely, suggesting radically different epistemic conditions than the cave allegory.⁴ In the cave allegory, Plato imagines that people only see the shadows of objects cast by a fire, never the objects themselves. The shadows are untrustworthy because they only represent the real, but are not in fact the real itself.⁵ Yet in the case of Glaucus, the perceived object is not untrustworthy because it is only a shadow of the real thing; it is untrustworthy because the material thing is in fact changing all the time in seawater. As Gaston Bachelard put it much later (and in reference to fresh water rather than saltwater), “a being dedicated to water is a being in flux. He dies every minute; something of his substance is constantly falling away.”⁶ Glaucus’ body, too, is in flux: sculpted, maimed, and reworked by seawater, but also decorated by various animal and plant attachments. This poses an ontological problem for Plato, who speculates that we would know Glaucus’ “primary nature” if only we could lift him,

[...] out of the sea in which it now dwells, and if the many stones and shells (those which have grown all over it in a wild, earthy, and stony profusion [...]) were hammered off it.

⁴ This dovetails nicely with the concept of “opacity” that Caribbean poet Edouard Glissant would later theorize.
⁵ Plato’s Cave: “Behold! human beings living in a underground cave, which has a mouth open towards the light and reaching all along the cave; here they have been from their childhood, and have their legs and necks chained so that they cannot move, and can only see before them, being prevented by the chains from turning round their heads. Above and behind them a fire is blazing at a distance, and between the fire and the prisoners there is a raised way; and you will see, if you look, a low wall built along the way, like the screen which marionette players have in front of them, over which they show the puppets.” Plato (1991), 253
⁶ Bachelard (1942), 6.
Then we’d see what its true nature is and be able to determine whether it has many parts or just one and whether or in what manner it is put together.7

This assumption—that to know something’s primary nature is to isolate it by extracting it out of its constitutive and sustaining element of habitation—reflects a certain terrestrial bias that is commensurate with the assumption that space is an empty container for objects and that air is immaterial.8 Already we see a variety of epistemic and ontological impasses: the difficulty distinguishing between self and environment, living and non-living, origin and supplement. The ocean prevents us from so easily thinking the object in isolation from its environment, especially with gelatinous organisms whose entire structure is buoyed by the surrounding milieu of water. Wanting to isolate Glaucus as an object out of the water to determine his “parts” exemplifies a terrestrial epistemics, when Plato could have done the opposite: consider the ocean as an alternate habitat for philosophical inquiry. Here I do not mean that Plato should have followed Heraclitus and Thales in thinking about water and fluidity as primary—that water gives us a way to better think the conditions of the real. Rather, what I find interesting about the story of Glaucus is the way that it could have been told differently to provide an estrangement effect by displacing a consideration of ideal forms into the ocean. The cognitive estrangements made possible by oceanic alterity change the way that we approach the study of media.

My goal in Wild Blue Media is to develop conceptual displacement—a method of relocating concepts in media theory underwater, to see how they change—as a critical and science fictional strategy for rethinking the conditions of knowledge through the estranging medium of the ocean. Such an estrangement effect owes homage to the Verfremdung of Brechtian

7 Plato (1991), 283.
8 Jules Michelet has also written of the way scientific analysis of seawater destroys its object: “Chemical analyses do not explain this characteristic [of the viscosity of seawater]. In it, there is an organic substance which these analyses reach only by destroying it, by taking away from it its special properties and by reducing it violently to the general elements.” Michelet (1864), 52-53.
theater and Darko Suvin’s classic definition of science fiction as the genre of cognitive estrangement, aiming not at a description of reality as inherently watery, but instead, through using the ocean milieu as a way of seeing the “terrestrial biases” already present in the ways that we speak about media. In what follows, I will introduce the ways that we can trace the terrestrial bias of media through the examples of Rachel Carson’s imagination of the deep sea in *The Sea Around Us* and artist Jason de Caires Taylor’s “Underwater Museum.” Each work both imports and resists a “terrestrial bias” while imagining the ocean as media. In the ocean environment, much of what we desire in the form of cultural monuments, such as those stored in a museum, is put to the test: as we saw with the example of Glaucus, objects are in flux, different at each visitation rather than carefully curated and preserved to be constant over repeated viewings.

Seawater exhibits a paradoxical power both to preserve and to erase, with implications for how we may understand mediality when the medium is the ocean. If the ocean is a vault, it is not the kind that stores objects untouched, separate, and petrified—the materiality it “stores” is always on the move, in the process of being transformed. In the ocean, then, we need to think about mediality as ephemeral, not in the sense of an accident (or something undesired), but in the sense of existing *necessarily yet contingently* in a watery context. Carson’s “Long Snowfall” chapter and Taylor’s “Underwater Museum” present occasions to rethink media theory in relation to the specificity of the ocean environment, a specificity that allows for preservation only through change.

### 1.2 The Terrestrial Bias in Media Theory

My turn towards the ocean participates in the emerging field of “Ocean Humanities,” or “Blue Humanities,” which is the emerging, heterogeneous field that takes the ocean as a force for
conceptual reorientations across the disciplines of history, literature, anthropology, cultural studies, geography, and, not least of all, gender & sexuality studies. These fields have, respectively, turned to the ocean for different reasons. For example marine organisms confront us with situations where “nature is queerer than culture”: from naturally occurring transsexual fish to asexual jellies and colonial organisms, marine organisms destabilize our expectations of heteronormativity across species, challenging our expectations of life and reproduction. Consider Eva Hayward’s “More Lessons from a Starfish: Prefixial Flesh and Transspeciated Selves”:

Meditating on the song “The Cripple and the Starfish” by Antony and the Johnsons (2000), Hayward argues for the regenerative potentiality of the “cut.” Enmeshing transsexual identity with starfish physiology opens up such narratives of regeneration that transcend the dialectic of absence and presence in favor of an identity in flux. Such views of bodily change are perhaps not dissimilar from Glaucus’ constantly dissolving and reintegrating “self,” in Frankenstein-like composition, remapped by not only cutting and pasting, but three-dimensional saturation, fusing, blurring.

Oceanic blurrings of boundaries have prompted scholars in geography, literary history, and transnational studies to think hydrographically rather than geographically, attending to the circulation of bodies, texts, and commodities across oceans. Thinking hydrographically has also

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9 Water has been potent in imagining specifically feminine alterity, such as Luce Irigaray’s *The Sex that is not One* (1977/1985). Here she explores fluid mechanics in as a figuration for understanding feminine forms of power and being that are of another order entirely from those of patriarchy. Yet in their chapter “Water and Gestationality” in *Thinking With Water* (2014), Mielle Chandler and Astrida Neimanis eschew any hard-and-fast groundings of water in any particular gender, offering the term “gestationality” to identify how water may help us rethink agency. For Chandler and Neimanis, “Gestationality defies the either/or structure of activity and passivity; it is neither active nor passive, and yet both active and passive.” Chandler and Neimanis write that, “We are concerned that an overreliance on action might unwittingly perpetuate an age-old chauvinism denigrating the ‘passivity’ previously attributed to nature, women, and inanimate objects, thereby upholding the deep structure of the very androcentric and anthropocentric binaristic ontologies that these theories aim to subvert.” This important point opens the space for thinking about water’s unique ontological status, and how it may help us reflect on some of our longstanding philosophical valuations.

10 Take Paul Gilroy’s pathbreaking text, *The Black Atlantic: Modernity and Double Consciousness* (1993), which critiqued “the unthinking assumption that cultures always flow into patterns congruent with the borders of essentially homogenous nation states” (5) and argued that cultural historians might, “take the Atlantic as one single, complex unit
figured as a challenge to contemporary ecocriticism to extend its scope beyond green landscapes. For example, Dan Brayton diagnoses the “terrestrial bias” in ecocriticism and argues that there is a, “deep encoding [of the land] in the terminology and conceptual categories that define ecocritical inquiry.” One example of this is Gary Kroll’s discussion of what constitutes a “land ethic” or “wilderness ethic” for the ocean. Cohen’s edited collection *Prismatic Ecologies: Ecotheory Beyond Green* moves beyond the ocean, arguing that ecocriticism might extend towards a *spectrum* of ecological relations, tracing new ecologies through color as an analytic: to blue, gold, violet-black, and even X-ray. Ian Baucom expresses a similar intervention when he writes that the “hydrographic,” which he calls a “form of observation,” serves to not only to

[...] trouble or reorganize but to *multiply* our maps of the ‘real,’ to render visible some additional fraction of all those worlds virtually present within the world. And if, in doing so, they remind us that the world is a paradox of the many within the one, they also remind us that what we know of the world depends not simply on what ‘exists’ but on where we stand.12

Baucom’s argument that the ocean offers multiple “maps” of knowledge, rather than one true one, is commensurate with Cohen’s *Prismatic Ecologies*. However, while Baucom wants to imagine a map that directs us away from itself to “the place where we stand,” where we “discover that to observe is also to constitute, and to change,” he still imagines that we are standing. When we take the plunge into the volumetric space of the ocean depths, there will be no ground under our

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12 See Baucom (1999).
feet, and the –graphic in hydro- will give way to other materialities of media. Examining oceanic alterity in this way, as one of multiple milieu-specific conditions for knowledge, moves us away from what we might call hydro-realism (a higher reality that the ocean leads us to, espoused by the pre-Socratics) and instead towards hydro-estrangement, allowing for aquatically-situated perspectives that coexist with terrestrial and anthropocentric modes of knowledge.

I want to highlight the importance of considering a “terrestrial bias” in our conceptual vocabulary, yet approach this slightly differently than Brayton. Rather than thinking of what many people mean by “bias”—a word that has a reputation as being synonymous with “false belief” or “incorrect”—I would like to compare it to an inflection, or situated perspective, that responds to the fact that we live on land, are bound by gravity when we walk, and experience daily life as immersion in invisible air rather than water. Thus figurations of “ground” are not wrong in a falsifiable sense—rather they utilize the ground as a way of developing a picture of reality through an environmental imagination, an imagination situated terrestrially. One way we can think about situated perspectives is through metaphor theory. In their now classic *Metaphors We Live By* (1980), George Lakoff and Mark Johnson use linguistic evidence to show that the way we ordinarily speak is highly metaphoric, and these metaphors both structure cognition and correspond to our embodiment as human beings in the world. Lakoff and Johnson are keen to point out from their examples that metaphors often logically contradict each other. There is no overarching system, but rather meaning generated in the use; we situationally draw on metaphors in concert with our cultural, historical, and milieu-specific experiences. That cognition is embodied leaves signatures in our languages.\(^\text{13}\)

\(^{13}\) Taking a step back, Stefan Helmreich has provocatively suggested Lakoff and Johnson’s title might better read “lives we metaphor by” because this (1) pluralizes the lives alluded to and (2) playfully turns “metaphor” into a verb, an activity we practice rather than a preexisting system of meaning. Though he compellingly critiques Lakoff and Johnson’s example that “argument is war” for assuming a pre-cultural body, I find Lakoff and Johnson’s examples of
One of the key interventions that I want to make is for the humanities to consider the ocean as more than an object of study, or a territory for historical investigation, and instead as a unique milieu for producing singularly embodied perspectives that may yield a range of new conceptual/terminological formulations. Thus it is not enough simply to develop vocabulary specific to ocean contexts (like an “ocean ethic” rather than a “land ethic”); we also need to develop literary strategies—even science fictional strategies—for understanding areas of terrestrial inflection. In other words, we should not only attend to the absence of words to describe the ocean, but also to the form of the existing words and concepts we use to talk about the environment and media.

Consider what new media theory studies: computers, networks, algorithms, code, cables, digital representations, databases, programming practices. Friedrich Kittler, one of the leading German media theorists, has famously proclaimed that we are in a historical moment in which all our media forms are converging in the digital. In Kittler’s media genealogy, we moved from the hegemony of print texts to the splitting of recording media into different senses (gramophone, film, typewriter) in the 19th and 20th centuries, and now, to a convergence of these into digital forms of recording and storage. In focusing so heavily on the digitality of the future, however, Kittler neglects to consider the continuing importance of much older analog media that do not depend on human beings for their creation and perpetuation. Water, for example, exhibits technical properties like washing, rinsing, dyeing, and powering mills—properties that are not always seen as “technical” because they are so archaic. Even though Kittler is attentive to past analog forms in his media history, he neglects to consider the environmental conditions of orientational metaphors and directional time to be useful because they engage the science fictional question, “how might different bodies suggest different valuations of space?” See Helmreich (2012).  

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14 See Wall (2007).
possibility upon which digital media will continue to depend in the future: the production of energy through gas, coal, and nuclear power; the precious metals that are used to make computers, wires, smartphones; the many forms of manual labor that go into making digital media. In contrast to Kittler, I propose a “media ecology” that shares much with historical materialism, attending to the plurality of material conditions that support the existence of technical modes of production. While Kittler claims, “Media determine our situation,” I would like to invert this, and suggest that our situation, or milieu, also determines the possibilities of our media.

Consider the three most important terms in media theory for Kittler: transmission, storage, and recording. While these operate fairly intuitively in terrestrial contexts—we might imagine recording as typing on a computer, storage as a hard drive, transmission as an email—the ocean environment presents different conditions of possibility. If seawater is a storage medium, then it is not the same kind of “storage” we imagine that happens with a digital database, where all the records stay put. If we say seawater stores genetic material (like that of microbes and viruses), then we need to account for how what is stored continues to move: how those same microbes regularly swap genes. Seawater also changes how we understand the possibilities of “recording” or “inscription” in the sense of making marks on a page, or stone tablet. Underwater, any inscrip-tions would be eroded, washed away, or overgrown with marine plants and animals (imagine Glaucus’ sea-changed body, both eroded and encrusted with new life forms). Finally, in seawater, the most effective means of transmission might not be so cleanly channeled through electronic signals, but instead bleed across distances through smell (think of a shark smelling blood), or vibrated through sound (as in humpback whale song). The alterity of the ocean environment challenges how we have traditionally thought of the conditions for media—of storing, recording, transmitting—as dry processes.
One literary text that both exhibits and resists terrestrial biases, or inflections, towards media is Rachel Carson’s *The Sea Around Us*. *The Sea Around Us* was the last and most popular of Carson’s three ocean non-fiction books before she wrote *Silent Spring*. Here, she narrates the story of how the Earth formed an ocean, told on a mythic scale, of its gray beginnings and monstrous tides and Stygian conditions for life. Carson lyrically describes the seafloor as a meta-archive of Earth’s history in a chapter called “The Long Snowfall,” beginning with an image of sediments slowly drifting downward:

> When I think of the floor of the deep sea, the single overwhelming fact that possesses my imagination is the accumulation of sediments. I see always the steady, unremitting, downward drift of materials from above, flake upon flake, layer upon layer—a drift that has continued for hundreds of millions of years, that will go on as long as there are seas and continents.\(^\text{15}\)

Carson compares this inexorable process to a literary text:

> The sediments are a sort of epic poem of the earth. When we are wise enough, perhaps we can read in them all of past history. For all is written here. In the nature of the materials that compose them and in the arrangement of their successive layers the sediments reflect all that has happened in the water above them and on the surrounding lands. The dramatic and the catastrophic in earth history have left their trace in the sediments—the outpourings of volcanoes, the advance and retreat of ice, the searing aridity of desert lands, the sweeping destruction of floods.\(^\text{16}\)

For Carson, the seafloor is like the “book of nature,” a literary text waiting to be read by scientists with the right core sampling tools and instruments to decipher its pages. It contains not only the

\(^{15}\text{Carson (1950), 75.}\)
\(^{16}\text{Ibid., 76.}\)
records of the ocean—what lived in it—but also the records of the land: dust blown into the sea from deserts, dirt eroded and washed into the waves. Yet drawing on the metaphor of a “book” with “chapters,” or an “epic poem,” of course, imports specific assumptions about writing and recording that belong to terrestrial contexts. What about the role of seawater in filtering the sediments down to the floor? For example, does it not seem strange that Carson describes the geologic “inscription” of the Ice Age in the following way:

When [the icebergs drifting south] finally melted, they relinquished their loads of silt and sand and gravel and rock fragments that had become frozen into their surfaces as they made their grinding way over the land. And so a layer of glacial sediment [formed] […] and the record of an Ice Age was inscribed [on the seafloor].

Whereas “inscription” etymologically implies a mark made on a surface, consider the multiple elements and media in play here: three dimensional blocks of ice “grinding” over the land before melting into the ocean, filtering down through hundreds of feet of water before blanketing the seafloor. Here, the “record” of the Ice Age depends on the medium of the ocean to transport and filter sediments to the seafloor.

The tension between Carson’s book metaphor, as a kind of dry medium, and oceanic materiality becomes even more apparent when she imagines the “snowfall” of microscopic sea creatures, whose “discarded little shells of lime or silica that had encased them in life began to drift downward to the bottom,” accumulating on the seafloor. Some of these shells, in passing through the water column (or vertical measurement of water from surface to seafloor), actually dissolve. Carson continues,

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17 Ibid., 82.
18 Ibid., 75.
In the great depths of the ocean, however, the immense pressures and the high carbon dioxide content of deep water dissolve much of the lime long before it reaches the bottom and return it to the great chemical reservoir of the sea. Silica is more resistant to solution. It is one of the curious paradoxes of the ocean that the bulk of the organic remains that reach the great depths intact belong to unicellular creatures seemingly of the most delicate construction. The radiolarians remind us irresistibly of snowflakes, as infinitely varied in pattern, and as intricately made. Yet because their shells are fashioned of silica instead of carbonate of lime, they can descend unchanged into the abyssal depths.¹⁹

What is remarkable about this passage is that it deviates from Carson’s organizing metaphor of the sediments as a “book” or “epic poem,” and instead focuses on the physical and chemical materiality of seawater to dissolve material. Carson points to both “pressure” and the “high carbon dioxide content” in deep water as forces of erasure, as opposed to processes of accumulation and recording. As a force of dissolution, seawater both thwarts and enables the formation of a sediment record—transporting some types of sediment, like silica, but erasing others, like the calcium carbonate shells of microscopic marine crustaceans. Even though this aesthetic of dissolution both facilitates and removes the conditions of recording and storage, for Carson it remains obfuscated by the overriding metaphor of the seafloor as an “epic poem” and text. What Carson teaches us, then, is to be sensitive to language and terrestrial metaphor, to how dry media tend to shape how we speak about underwater media, but typically not vice versa. The ocean environment requires attending to what I call the “milieu-specificity” of language, such that we cannot so easily transpose terrestrial concepts in media into ocean environments without having to reconsider fundamental aspects of them.

¹⁹ Ibid., 80.
1.3 Milieu-specific thought

What I call *milieu-specific thought* calls attention to the differential perceptual environments of humans, animals and machines. Attending to milieu—a word with a rich history ranging from mechanics to biology that, in George Canguilhem’s usage, alternates between being “a centered space” or “mi-lieu [mid-place],” and a “decentered space” (intermediary field) or “mi-lieu [mid-place]”—stresses the tension between the observer and the environs they think from.\(^{20}\) Whereas a great deal of work has been done on bodily difference in relation to individual phenomenology and epistemic frameworks, relatively little scholarship has attended to milieux *in addition to* considerations of bodies.

One of the philosophers important to the consideration of milieu is the early 20\(^{th}\) century Estonian biologist Jacob von Uexküll, whose elaboration of animal *Umwelts* or “perceptual worlds” helps us begin to think about milieu-specificity. Uexküll’s methodology is to show how an animal is uniquely and sensorily “attuned” to “perception marks” in its environment that are of biological significance for it. He distinguishes between “surroundings” (everything we would notice in our human experience) and “environment” (an order created by the subject’s specific disposition and activity). In this schema, the animal’s environment is “only a piece cut out from its surroundings” which are “our own human environment.”\(^{21}\) Uexküll goes further, arguing that, “there is no space independent of subjects. If we still want to cling to the fiction of an all-encompassing world-space, that is only because we can get along with each other more easily with the help of this conventional fable.”\(^{22}\) Uexküll’s attention to species-specific environmental cues as sources of meaning begins to destabilize the hegemony of anthropocentric thought, of

\(^{20}\) Canguilhem (2010).

\(^{21}\) Uexküll (2010), 53.

\(^{22}\) Ibid., 70.
attending to the variability of meaningful worlds.\textsuperscript{23} Uexküll, in my mind, should be mandatory reading for any prospective writer of science fiction, because he introduces a way of considering alternate perceptual worlds beyond that of the comfortable human body. \textit{Umwelt} is useful for thinking about the differentials between the perceptual worlds of not only animals and humans, but also of machines—which have long been assumed to construct “objectivity.”\textsuperscript{24}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure4}
\caption{Melody Jue, \textit{The “Umwelt” of a GoPro camera, Honolulu, HI.}}
\end{figure}

Attending to Glaucus \textit{in the ocean milieu} introduces the problem of \textit{non-inscriptive media and memory}. Here, I do not mean media technologies adapted to exist underwater, but instead the

\textsuperscript{23} Although Uexküll assumes that human beings perceive the environment most completely, Geoffrey Winthrop-Young—in his introduction to \textit{A Foray into the Worlds of Animals and Humans}—rightly argues that human beings, too, have limitations on their perceptive worlds.

\textsuperscript{24} Daston and Gallison (2010).
technicity of seawater itself, of liquid media. Let us return to Glaucus’ body: if it is a kind of “archive,” it is not one exactly *inscribed* by seawater and animals in the sense of marks made on a stone or paper. It is, rather, saturated, encrusted, deformed, eroded, and transfigured by the burgeoning growth of other creatures. These verbs all matter, indicating a different set of processes than those assumed by the “mark” of inscription on a hard surface. As we will see with Vilém Flusser (Chapter 2), to make a mark on any hard surface underwater is a futile act, for it can easily be rinsed away, dispersed, or overgrown with small plants and animals. The ocean complicates the notion of an origin, different from the methods of deconstruction because of the emphasis on the *milieu*(x) of seawater as it poses an alternate tradition to that of writing.

It is time to start thinking about the technicity of seawater and fluids themselves. Commenting on photography’s dry character—that water must not enter the camera itself—photographer Jeff Wall reminds us that, “[the archaism of water] embodies a memory-trace of a very ancient production process—of washing, dissolving, bleaching, and so on, that are connected to the very origin of techne.”25 The technicity of water is so naturalized and intuitive that it has faded out of conscious recognition. Alex Galloway discusses this fading: “the more intuitive a device becomes, the more it risks falling out of media altogether, becoming as naturalized as air or as common as dirt. To succeed, then, is at best self-deception and at worst self-annihilation.”26 Fluids like seawater and air are both examples of techne that have fallen out of media, “naturalized” and thus effaced as techne, too common to stand out, their biomedical work gone unnoticed. Yet as I will show in the following chapters, seawater and air are both anti-inscriptive forms of media that necessitate not only a new vocabulary but a critical examination of the terrestrial metaphoricity of inscription, and other key terms in media.

26 Galloway (2013), 25.
*Milieu-specificity*—the critical practice of attending to the environmental pre-conditions for thought—both acknowledges and breaks from earlier discussions of medium-specificity in art theory and media theory. “Medium-specificity,” for example, has been discussed by Clement Greenberg as the critical attention to what an artwork is made out of. Greenberg writes of Modernist painting, “It quickly emerged that the unique and proper area of competence of each art coincided with all that was unique to the nature of its medium. The task of self-criticism became to eliminate from the effects of each art any and every effect that might conceivably be borrowed from or by the medium of any other art.” Greenberg’s medium specificity is more focused on the object itself rather than its surroundings or existential context. Katherine Hayles’ “medium-specific analysis” (MSA) in *Writing Machines* (2002) is much different. Rather than simply applying terminology and critical approaches developed in the field of literary studies to the emerging field of media studies, Hayles writes that MSA, “moves from the language of text to a more precise vocabulary of screen and page, digital program and analogue interface, code and ink, mutable image and durable mark, computer and book.” MSA calls for vocabulary specific to different media, while at the same time not isolating them as objects. What media studies might learn from literary studies is the importance of embodiment and context: “Understanding literature as the interplay between form, content, and medium, MSA insists that texts must always be embodied to exist in the world. The materiality of those EMBODIMENTS interacts dynamically with linguistic, rhetorical, and literary practices to create the effects we call literature.” In agreement with Hayles’ call to attend to embodiment, *milieu-specific thought* asks that we consider the environmental conditions that make such analysis possible in the first place. 

Thinking with the ocean requires a method of analysis that focuses on both the materiality of the

27 Greenberg (2003).
28 Hayles (2002).
29 Ibid., 31.
environment and the perceiver attuned to it as a condition for thought. What I term *milieu-specific analysis* proceeds from the following: *how would the conditions of knowledge about (x) change if you were to displace or transport it to a different environmental context?*

1.4 Conceptual Displacement

Conceptual displacement might remind us of the legendary moment when Archimedes stepped into the bathtub and realized that he “displaced” the volume of water equal to that of his body. To displace, in this sense, is to measure one’s self through stepping into the water such that both self and environment mutually measure each other through the experience of immersion and contact. Taking a scene like this as a template for a method of conceptual displacement, of dislocating terrestrially nurtured thought into the ocean as an alternate milieu, means implicating oneself in an act of mutual-measurement. Like the ocean planet in Stanislaw Lem’s novel *Solaris*, as much as you measure the ocean, it measures you. *Conceptual displacement* as a method implies two modes mutually at work: (1) *cognitive estrangement* and (2) *milieu-specificity* of the ocean as an environment for thought, which involves the material imagination of seawater as a poetics. Conceptual displacement is thus distinct from existing but important studies that discuss

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30 One controversial example of a scholar who points out a bias towards terrestrial environments is Elaine Morgan, in her “fringe” theory of the Aquatic Ape Hypothesis (AAH) in evolutionary anthropology. The AAH proposes that distinctly human evolutionary traits—such as walking upright, nursing from the front—evolved not on the savannah, but while our ancestors waded in water. Morgan provocatively writes, "Behavior does not fossilize," which points to the joint problem of reconstructing past social motivations and the past environment. Yet even though Elaine Morgan saw her work as revolutionary, I would argue that her work is not successful in shifting the paradigm that evolutionary biology works within. She still wants to ascribe purpose to different evolutionary adaptations, viewing evolution in relation to the calculation of benefits. Morgan’s teleological approach—to couch human adaptations in the language of “benefits”—is consistent with the existing paradigm, even though it positions itself as a radical theory diagnosing the terrestrial bias within evolutionary anthropology’s theories of past environmental conditions for human evolution. 30 This example should prompt a more careful consideration of milieu specificity—in that accounting for the environment is not the entire picture, but must be complemented by analyzing ascriptions of desire and other agential language.
technologies in marine environments.\textsuperscript{31} Much like metaphor—which is fundamentally a matter of transport, of moving between sensibilities—conceptual displacement involves a factor of movement.\textsuperscript{32} In a similar vein, Eva Hayward puts it nicely when she writes, “No doubt a grammar of liquefication would start by turning all nouns into verbs.”\textsuperscript{33}

Philip K. Dick has defined science fiction as a genre predicated on a certain “conceptual dislocation,” or estrangement from one’s familiar experience. In good science fiction, “The conceptual dislocation—the new idea, in other words—must be truly new (or a new variation on an old one) and it must be intellectually stimulating to the reader; it must invade his mind and wake it up to the possibility of something he had not up to then thought of.”\textsuperscript{34} This resonates with Darko Suvin’s classic definition of science fiction as a literary genre predicated on (1) a novum, or new element distinct from the reader’s universe and (2) “whose necessary and sufficient conditions are the presence and interaction of estrangement and cognition, and whose main formal device is an imaginative framework alternative to the author’s empirical environment.”\textsuperscript{35} Suvin drew on the Brechtian Verfremdungseffekt, a theater technique sometimes translated as “alienation effect” that makes the audience hyper-aware of themselves as observers rather than immersed in the drama that enfolds them. Carl Freedman emphasizes that SF need not depend on a kind of falsification thesis or external reference to the reality of the novum; what matters is “the

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\textsuperscript{31} For example, Helen Rozwadowski’s excellent work on the history of technology in marine environments, as well as her and David Van Keuren’s edited collection \textit{The Machine in Neptune’s Garden: Historical Perspectives on Technology in the Marine Environment} (2004).
\textsuperscript{32} Michel de Certeau writes that in modern Athens, public transportation vehicles are called metaphorai. “To go to work or come home, one takes a ‘metaphor’—a bus or a train. Stories could also take this noble name: every day, they traverse and organize places; they select and link them together; they make sentences and itineraries out of them,” \textit{The Practice of Everyday Life} (2002), 115.
\textsuperscript{33} Hayward (2007), 33.
\textsuperscript{35} Suvin (1979), 7-8.
attitude of the text itself to the kind of estrangements being performed."\textsuperscript{36} Reading SF as a tendency, or attitude, allows us to see the ocean environment as a science fictional space for the way that it “estranges” our terrestrial perspectives on space, life, and normativity in relation to the material specificity of seawater. The ocean is a “natural environment” for science fiction, asking us to think about unfamiliar conditions for life, epistemology, normativity and conceptual thought.

I now turn to Jason de Caires Taylor’s \textit{Museo Subacuático del Arte}, or “Underwater Museum,” as an example of a work that performs a kind of conceptual displacement of the “museum” or “archive” beyond terrestrial intentions and sensibilities. This study is based on research that I conducted in July 2014, with the assistance of a Summer Research Grant from the Duke Graduate School, traveling to Isla Mujeres, Mexico, to dive the works in person. Through this example, I hope to elucidate not only the method of conceptual displacement, but also how the humanities can engage with scuba diving as a practice of speculative media ecology.

\textsuperscript{36} Ibid., 18.
When I imagine a museum, I imagine a quiet, dry, sanctified space dedicated to the careful preservation of objects—often ruins—for future generations to see intact. Lighting, temperature, and humidity are carefully controlled so as not to damage the fragile artworks and archeological objects. Preservation rules the desires and intentionality of the museum space, an archival environment that carefully separates observer from observed in every tactile sense, yet gathers them together for a shared visual—at best, haptic—spectacle. We navigate museums through walking, our feet bound by gravity to the surficial floor, our eye level determined by our natural height and display choices.

Now consider Taylor’s underwater museum: comprised of clusters of human figures placed 30 feet underwater, the works are vibrant communities in flux, shaped by the materiality
of the ocean environment. Here, seawater itself—the carrier of coral eggs and other life forms—figures as an artistic and evolutionary force that transforms the sculptures into colonies of organisms. It is not difficult to see these sculptures as views of a posthuman future, of co-evolution between human and other species, and a blurring of boundaries between subject and environment. Yet because the sculptures are primarily human figures underwater, they appear vulnerable, and have provoked historically specific reactions that link them, for instance, to the Middle Passage. To that extent, Taylor invites us to consider the underwater museum’s unique tension between preservation and ephemerality not only in abstract terms, but also in terms of the historical struggle and survival of human communities.

Taylor, it seems, both embraces and resists the way that seawater preserves and changes submerged objects. In an artists’ statement, he writes that the works serve both as art and, as “artificial reefs, attracting marine life, while offering the viewer privileged temporal encounters, as the shifting sand of the ocean floor, and the works change from moment to moment.”37 Art meets artifice to provide new habitats, and to draw attention to the deteriorating condition of reefs worldwide as a result of human activity, hurricane damage, and climate change. Yet despite the way that the sculptures are designed to change over time, Taylor advertises the experience of commissioning a sculpture of yourself as an “immortalization process,” one that was, he adds, “described by a previous volunteer as the only way to ‘live for ever.’”38 When the organization Mission Blue profiled Taylor’s works, he described the sculptures in this way:

We have a countdown on our natural reefs at the moment. Scientists are predicting that in 50 years we would have lost almost 70% of our natural reefs, which is quite a heavy statistic. I kind of want to set in stone how we knew this was going to happen so that in

38 Email, dated Dec. 2, 2014. In fact, you can apply by submitting four photographs of yourself and paying €500 for materials.
50 years time, when people look back and say ‘They knew! Why did they not do anything? Why did they not take action?’ I want it to be immortalized there in stone that we knew this was going to happen and we were responsible.39 Of course, there exists much more evidence that “we knew this was going to happen” than the sculptures. Further, we might note how this approach to “immortalizing” our awareness of climate change, with all its religious overtones of guilt and culpability, might remind us of land museums, directed towards the preservation of objects (or often, ruins) from a particular historical moment. Just as we saw how the book metaphor overshadowed the agency of seawater for Rachel Carson, here we see the openness of the underwater museum overshadowed by the desire to memorialize and “immortalize,” acts that remind us of the terrestrial museum.

Although Taylor might argue that what he is aiming for is an immortalization of human awareness of climate change through underwater sculptures designed to change over time, things are complicated by the fact that his works exist across several different media in addition to seawater: in high-quality photographs on the Internet and in magazines, in Google Street-view as recorded through a 360-degree lens by Caitlin Seaview Survey, and in a terrestrial gallery in Kukulcan Mall. Each medium offers a different engagement with preservation and ephemerality. My first encounter with the sculptures was seeing them as digital photographs, as curated on Taylor’s website. It was not until I dove the museum in person that I began to think back on the visual role of seawater in the images. Taylor’s almost hyperreal photographs were taken on particularly clear days, rendering invisible the very substance of seawater that shapes, builds, and erodes the sculptures. My photographs of the site were taken on a murkier day where the haze of seawater and life-forms in it changed the visibility and quality of light. In Taylor’s photographs

the ocean is invisible but at work, a speculative dimension requiring an imaginative leap on the part of the viewer to envision how seawater sculpts and shapes objects. There is thus a gap between how the underwater museum exists in digital media and how one encounters the museum underwater—as an analog medium. The difference has to do with whether one focuses on the objects and their transformation, or on the opacity of the seawater, the supportive but hazy milieu.

Figure 6: Melody Jue, Sculptures from Jason de Caires Taylor’s “Silent Evolution.”
Another difference between how the works exist in digital media and in seawater has to do with what I would call an ethic of proximity. The digital instantiation of the sculptures in Google Streetview simulates the experience of a dive (Fig. 9). Even though the simulation is supposedly underwater, the “streets” in Google Streetview remain the guiding navigational aesthetic, invisible, but indicated by arrows that appear when you move your cursor. This provides the illusion of free movement, despite the fact that your movement is in fact constrained by the pathways swum by the diver with the recording camera (although you can pivot in place). In choosing a direction, you cannot tell whether the arrows correspond to “streets” that lead up and over the sculptures, or down into their midst. With Google Streetview, you do not have to worry about buoyancy, navigation, sinking, or running into any objects—Google’s translation of the ocean into digital space simulates the ocean’s visual qualities rather than its viscous, buoyant,
or chemical properties. Thus, a major difference between Google Streetview and diving the sculptures in person has to do with the presence of the body, its intrusiveness and ripples of disturbance that accompany every observation.

**Figure 8:** Melody Jue, *Hovering over “Silent Evolution.”*
When I visited the underwater museum in person, I had to constantly negotiate my proximity to the works through controlling my buoyancy so as not to sink and hit the sculptures. This entire dimension of the physical body’s relations with the sculptures—of constant movement...
and negotiation—was missing from the digital and photographic forms of the underwater museum. Absent as well was the pleasure of “flying” over, upsidedown, and around the sculptures as I desired, free to see what kinds of colorful life lay in the tiniest of corners—like carpets of tunicates and the tips of new corals, slowly growing by laying residues of calcium carbonate on skeletal foundations. Hovering is a more common vantage point when diving the works (Fig. 8), whereas most of Taylor’s photographs concern frontality, focusing on faces, singling out individual transformations. Hovering, and not being able to dip down into clusters of sculptures packed too tightly for a diver to fit, made them feel like one giant organism rather than individual people. I was surprised to recognize that one of my favorite sculptures from Taylor’s photographs, on the edge of one cluster, was not a large woman but a short man with a suitcase (Fig. 10). He seemed much more alone in the ocean than when I had seen him in the photograph, and his body seemed to have changed upon this closer look: instead of bright pink tunicates, a swath of green algae now coated most of his figure.

Diving through the underwater museum calls attention to seawater as a connective fluid, and made me realize that the very fluid supporting my efforts bore the dissolved material traces of the objects I had come to “visit” in the first place. Rather than a roving eye wandering the museum, I found myself more like an immersed, bubble-breathing disturbance whose presence ever so slightly altered the flows around the historical objects. What I felt was the most “ethical” dimension of the museum was not what it visually evoked, so much as what it required of me as a visitor: constant movement and negotiation, an awareness of finding myself in the same world as the sculptures, sharing a sense of the vulnerability and fragility with the submerged figures.

However, the questions of preservation and erasure raised by Taylor’s sculptures across media have implications beyond simply saving coral reefs: because of their Caribbean location, they also evoke—or upwell—the controversy of Middle Passage history. Although Taylor sees
the sculptures as simply speaking to issues of ecology and coral reef health—especially the recent bloom of algae covering the museum—the sculptures clearly possess a signifying power beyond his intentions. They have provoked many viewers to interpret the works as being memorials to the Middle Passage, especially because some of the sculptures were cast from people of African-descent, evoking the very image of the drowned slave, especially in the Grenada site. Taylor has strongly denied this approach to the sculptures as his intention, but also said that he is “very encouraged how it has resonated differently within various communities and feel[s] it is working as an art piece by questioning our identity, history and stimulating debate.”

One reaction to Taylor’s disavowal, on the website of America’s Black Holocaust Museum, was to leave the following text crossed-out, identified as a misreading:

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**Figure 11:** Screen shot from the website of America’s Black Holocaust Museum

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The fact that the Black Holocaust Museum left the text crossed out, rather than simply deleting it, serves as an expression of resistance to the authorial intention of the works, leaving the viewer to negotiate between “correct” reading and the compelling force of the “misreading.” The image of the drowned slave thus haunts Taylor’s work both visually and typographically in the exact sense of the phrase “under erasure,” as Derrida would have it, in danger of disappearing but still partially visible. Does this typographic strategy not evoke the very aesthetic of sea change that the sculptures embody, of the human figure “crossed” by new organisms but still partially discernable? And does not the fact of the Zong massacre—that insurance money could be collected if slaves were thrown overboard—draw a disturbing resonance with Ariel’s song about the sea-changed body turned into pearls and coral, in that both the slaves and the coral/pearls were “worth something”? Surely the environmental message about coral reef degradation would only be enlivened and empowered, rather than obscured by, these resonances with Middle Passage history, of shared vulnerability and the condition of being under erasure.

Part of my frustration surrounding the Taylor’s lack of engagement with Middle Passage history is that it wouldn’t be that difficult to intentionally evoke it through oceanic displacement—especially because there are precedents, in poems like Derek Walcott’s “The Sea is History” or Edouard Glissant’s imagination of “balls and chains punctuating the sea floor” in The Poetics of Relation. One group in popular culture that has used literal displacement in the ocean towards remembering the Middle Passage is the Detroit music group Drexciya. Drexciya’s “sonic science fiction” imagines a world where the unborn babies of mothers thrown overboard during the Middle Passage survived, transitioning from breathing in the watery womb to breathing in water, creating their own bubble metropolis. The surprise of survival, and transhuman adaptation beyond the imagination of Jules Verne, calls attention to the ocean as a site of utopian possibility, vehicle for remembrance, and space from which to launch critique.
Here, oceanic displacement resonates with Suvin’s definition of science fiction as a literary genre of “estrangement,” whose “main formal device is an imaginative framework alternative to the author’s empirical environment.” When our “imaginative framework” is the ocean, we are in a position to think about unfamiliar or “estranging” conditions for life, normativity, and futurity.

I have made the argument that the materiality of seawater changes how we think about media objects and concepts—like Kittler’s trinity of recording, storage, and transmission—and that medially becomes messier, more indistinct, uncontained, and ephemeral in ocean contexts. With Rachel Carson, we saw that the connotations and etymological roots of words we causally use like “inscription” do not so easily hold up in the ocean, which can both filter and dissolve material destined to form the geologic “record” in the sediment. Yet where Carson imagined the “long snowfall” of marine detritus from the distant perspective of a roving eye, the underwater museum asks us to consider underwater media in relation to specifically human concerns about survival—where life might exist, where it has ceased to exist, or where it might go on transformed into something we never imagined.

Taylor’s underwater museum exemplifies conceptual displacement as a critical strategy that attends to what changes during the movement from one environment to another in terms of materiality, intentionality, and desire. Moving the institution of the museum from land to seawater asked us to rethink the museum in terms of how we design objects to endure versus how we design objects to continually change. Although not explicitly Taylor’s intention, both interpretations of the sculptures as “memorials”—to Middle Passage or to coral endangerment—point to a broader politics of displacement, such that displacement becomes a political and science fictional tactic to think about communities and endangerment, past and present, when

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41 Suvin (1979), 7-8.
human lives and environmental health are at stake, exemplified in the Maldives’ underwater cabinet meeting from 2009.\textsuperscript{42}

Yet conceptual displacement still depends on how we imagine the material properties of seawater. And towards this, I want to caution against thinking of seawater as an element with stable characteristics in a kind of new elementalism. We should not reify the ocean’s qualities or idealize them, but attend to its materiality in particular moments. We might turn back to Rachel Carson and how she ended her chapter on “The Long Snowfall,” where she muses, “It is interesting to think that even now, in our own lifetime, the flakes of a new snow storm are falling, falling, one by one, out there on the ocean floor […] Who will read the[ir] record, ten thousand years from now?”\textsuperscript{43} What is so poignant about this moment is that we now know that the many shells drifting towards the bottom of the sea are in danger of being dissolved even more quickly, and at an unprecedented scale, with ocean acidification. Thus thinking with seawater in the future will need to attend to the way that \textit{the milieu of seawater itself is changing}, an important lesson to keep in mind with the tactic of conceptual displacement; for oceanic materiality is, itself, always already on the move.

\textbf{1.5 Outline of chapters}

The critical technique I develop of “conceptual displacement” in my dissertation, of rethinking media in and through the ocean, thus exists in relation to such politically-motivated forms of displacing human life underwater that sustain a tension between memory and forgetfulness, ephemerality and permanence, raising the question of how media and recording practices are, fundamentally, entangled with the persistence of human communities—of what we

\textsuperscript{42} See Chapter 4 for an extended discussion of the underwater cabinet meeting.
\textsuperscript{43} Carson, \textit{The Sea Around Us}, 82.
want to survive. Each chapter takes a key concept in media theory—inscription, database, interface—and displaces it underwater, pointing to areas of terrestrial inflection or bias.

Chapter 2, “Vampire Squid Media,” considers the concept of “inscription” in media theorist Vilém Flusser’s speculative fiction, *Vampyroteuthis Infernalis*. This fictional science fable broadly imagines the abyssal world of the vampire squid as a pretext for considering photography as a medium that marks a transition in society from valuing objects, like individual photographs, to the information transmitted, such as a film negative. Unlike earlier theories of photography (Barthes, Sontag, Snyder), Vampyroteuthis is different in form, taking the abyss as a literary environment for media theory. Evoking the methodological tradition of science fiction’s “cognitive estrangement,” *Vampyroteuthis Infernalis* invents a comparative epistemology between human and vampire squid in order to gain critical distance on photography, which in turn changes how we think about inscription. In the abyssal environment of Vampyroteuthis, inscription on paper or even stone tablets is eventually eroded by seawater or encrusted with growth; thus the vampire squid communicates through the non-inscriptive media of liquid ink clouds and skin paintings. Because these liquid media have their own historicity, but are not accommodated by a concept of inscription, I suggest thinking through a concept of “residue.”

Moving from inscription to the concept of storage, Chapter 3, “Proteus and the Digital,” analyzes the assumption that the ocean is a “natural database” by looking at how two different data visualizations, Google Ocean and the artwork ATLAS in silico, render seawater. I show how our conception of “database” comes from computers, valuing the preservation of data intact—which is the opposite of what seawater does to things. Indeed, the chemical and vital properties of seawater transform what is “stored” underwater through processes of erasure, encrustation, and saturation. Seawater asks us to rethink terrestrial notions of the archive or database as informed by the language of earth and sediment, and instead consider storage in terms of seawater’s
capacity for protean transformation. I show that the scale at which we look at seawater matters; the protean properties of seawater are meaningful at a macro scale (as in Google Ocean), but on increasingly microscopic scales, processes of abstraction make seawater commensurate with digitality (as in ATLAS in silico). I conclude by discussing the idea of “cultivating” an archive as an alternative driving principle distinct from the stasis of preservation.

Chapter 4, “Fathoming the Interface in Scuba Diving,” considers how narratives of scuba diving change the way that we understand the concept of the interface. While media theorists have described the interface as any surface across which human users can exercise control (screens, keyboards), diving suggests a relationship with technology that is less about control than about participation and vulnerability. I read a latent theory of media in narratives by Jacques Cousteau and Sylvia Earle, two of the most visible figures in ocean environmentalism. Their diving narratives suggest a distributed technical interface between air, body, regulator and tanks, where air sustains life, enables buoyancy, and determines the amount of time before one can safely surface. I show how diving—beyond its image as a recreational activity—leads us to questions of environmental justice when we consider the figure of the human being underwater.

In naming this project “Wild Blue Media,” I want to gesture to “wildness” as a way for thinking about multi-species and machinic perceptions media, “blueness” as a way for thinking ocean environmental contexts beyond the “green” brand of ecocriticism, and “wild blue yonder” for its uncontained, speculative orientation to futurity. The ocean does not offer a higher degree of reality than perspectives from the land, but it does offer perspectives that, in their co-existence, ask us to speak more milieu-specifically about concepts, senses of history, and communication. Thinking media through the ocean opens onto questions of desire, ecology, and ethics: what do we want from our technologies, and what kind of media might emerge from a cultural valuation of ephemerality, designed to fade or change over time? In what ways might environmental
literature and film prompt us to rethink the place of the analog in media, so long overshadowed by the digital? How might humanists engage with scuba diving as an ethical and critical practice? And finally, how might conceptual displacement lead to new strategies for studying “media ecology,” by reconsidering what count as media or technical substances, like air and water? Oceanic alterity provides an important check on the limits of theory and terrestrial knowledge production, compelling us to have the humility to continually try to see—and describe—differently.
2. Inscription: Vampire Squid Media

What fascinates the photographer is not the photographic paper, the object, but the information transmitted. The photographic paper is for the photographer what the skin is for Vampyroteuthis: a medium for colorful messages.

—Vilém Flusser, *Vampyroteuthis Infernalis*

If the body is an apparatus and an interface—a medium, in other words—then zoology becomes the open book of comparative media studies.

—John Durham Peters, *The Marvelous Clouds*

### 2.1 Diving into Vampyroteuthis

![Illustration of *Vampyroteuthis Infernalis* by Carl Chun, 1910.](image)

*Figure 12: Carl Chun, Illustration of *Vampyroteuthis Infernalis*, 1910.*
Vampire squids are useful to think with. Combining the figure of the vampire—which Friedrich Kittler has already connected to media systems—with the tentacular body of a mollusk that lives in the underwater abyss, the vampire squid provides a potent form for imagining configurations of power, communication, and the opening or closure of freedom.¹ We might look to Matt Taibbi’s *Rolling Stone* article that calls the investment bank Goldman Sachs a “great vampire squid wrapped around the face of humanity, relentlessly jamming its blood funnel into anything that smells like money,” conjuring an image of the vampire-as-rapist, one associated with Bram Stoker’s nefarious Count Dracula.² Critiques of imperial, colonial, and corporate entities find easy analogy in cephalopod bodies, which are often used in political cartoons to depict unchecked power, greed, or libidinal energy.³ The vampire squid body seems a ready-made villain, transporting mundane forms of power and control into the realm of fantasy and horror.

Figurations of the cephalopod body also speak to the ability of individual people to connect with one another in terms of movement, communication, and the erotics of touch.⁴ For example, the prepaid card in Hong Kong that enables one to ride public transportation (metro, ferry, bus, minibus) or to make purchases at grocery and convenience stores is called an “octopus card” (八達通), where rail lines radiate from the center of the transit map like tentacles.⁵ Tentacles also suggest the flows of interspecies sexuality, from the Japanese painting *Dream of* 

¹ Kittler (1992), 356.
³ The blog *Vulgar Army: Octoprop to Octopop* presents a collection of images from Europe, America, and Japan dating back to the 1830s that show octopi, vampire squid, kraken, and other tentacular creatures. The blog exhibits these cartoons in order to “identify and criticise themes in the use of the octopus as a polemic metaphor, for example, its use as signifying ‘action at a distance’ or in dehumanizing a group.” “About,” *Vulgar Army: Octoprop to Octopop*, n.d., http://octoprop.wordpress.com/.
⁴ Vampire squid are a genus of the class Cephalopoda (the name means “head-foot”) that includes octopi, squid, cuttlefish, and the nautilus.
⁵ This also translates as “eight arrival pass” or “go everywhere pass.” See Hong Kong’s MTR website, http://www.octopus.com.hk/home/en/index.html.
the Fisherman’s Wife to the anime/manga genre of hentai. Hsuan Hsu points out that both Occupiers and hipsters have claimed the octopus to connote the values of interconnectivity and flexibility in social media. Then again, so has the U.S. National Reconnaissance Office (NRO), which adopted an octopus logo with the motto, “Nothing is beyond our reach.” In these varied examples, the figure of the cephalopod drifts between opening and closing channels of material interconnection, navigating the space between utopia and dystopia that is perhaps more akin to Michel Foucault’s “heterotopia,” a multilayered site of cultural resonance.

Figure 13: The Patriot Post, Juxtaposition of the NRO’s new logo with an early political cartoon entitled, “Know your communist enemy,” 2013.

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6 Dream of the Fisherman’s Wife is an example of the Japanese erotic art shunga.
7 Hsuan Hsu, “Put an Octopus on It!” Salon, 5 July 2012, http://www.salon.com/2012/07/05/put_an_octopus_on_it/.
I now turn to the story of one particular cephalopod, the protagonist of Vilém Flusser’s philosophical fable *Vampyroteuthis Infernalis* (1987) or “the vampire squid from hell.”\(^{10}\) Flusser’s fable broadly imagines the abyssal world of the vampire squid as a pretext for considering photography as a medium that marks a transition in society from valuing objects (like individual photographs) to the information transmitted (the film negative). The abyss dramatizes this condition, where inscription on paper or even stone tablets is eventually eroded by seawater or encrusted with growth. Flusser imagines that the recording of history will have to occur via inscription on subjects, or other vampire squid, rather than on external objects, through ephemeral media such as the squid’s skin (like photographic paper, “a medium for colorful messages”).\(^{11}\) The deep sea models both the primordial past through the ancient Vampyroteuthis and an emerging future, or what Flusser calls “post-history,” where photographers create images that inform the behavior of future viewers such that “society is in a feedback relationship to the camera.”\(^{12}\)

As fable and speculative fiction, *Vampyroteuthis Infernalis* is an oddity within Flusser’s broader oeuvre.\(^{13}\) His writings typically appear as short, philosophical meditations on technology, communication, language, design, and the existential effects of migration. Flusser’s most well-known work, *Towards a Philosophy of Photography* (1983), approaches photography as such within a broader historical context of technologies; it presents a clear framework for how to think about photography not in terms of mimesis or capture but rather as the actualization of possibilities within the camera apparatus. Through its consideration of ideological function in

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\(^{10}\) *Vampyroteuthis Infernalis* was originally published in German, but I refer to the English translation by Rodrigo Maltez Novaes.

\(^{11}\) Flusser (1987), 115.

\(^{12}\) Flusser (2000), 46.

\(^{13}\) One notable exception is his discussion of the perspective of dogs in an essay called “Humanizations” (1990) published in *Writings* (2002), where he practices a “gymnastics of perspective” and argues that “all animal life is seen in terms of humanization” (p. 185).
relation to technological form, Towards a Philosophy of Photography adds to scholarly conversations around the materiality of media objects and what Katherine Hayles calls “media specific analysis” (MSA), analysis that attends to the specificity of form, user interactions, and the interpretive strategies the user develops.¹⁴

Vampyroteuthis Infernalis breaks from Photography in terms of genre and form (and also from MSA) by taking the abyss as a literary environment for media theory. Instead of delivering a tightly argued message or theory of how to think about photography, Vampyroteuthis Infernalis invents a creature and environment in which to gain critical distance. The “molluscan point of view” asks that we speculate how an intelligent aquatic organism would develop different concepts to orient itself to its world than those familiar to the dry landscapes of human thought.¹⁵

Vampyroteuthis Infernalis thus offers a comparative epistemology between human and vampire squid, a creature providing “enough distance from the human condition to be able to observe it,” whose point of view is “not transcendent.”¹⁶ Flusser describes his fable as both “scientifically exact and mad fantasy (fantasia essata),” musing that such a “philosophy of fantasy” could become a “discipline as rigorous as phenomenology.”¹⁷ If fantasy is always a scene, we might say that the deep sea is a kind of darkroom where Flusser develops his thoughts on photography through the “negative” image of the vampire squid.

Yet the richness of the abyss as a diegetic world exceeds Flusser’s prescribed intentions to talk about photography, spilling over into the wider terrain of philosophy. Flusser’s ocean abyss serves as an epistemic medium for thought, bringing into relief what I diagnose as the terrestrial bias of philosophy and critical theory. Through a consideration of the vampire squid’s

¹⁴ “MSA attends both to the specificity of form . . . and to citations and imitations of one medium in another.” See Hayles (2002), 30.
¹⁶ From a 1981 letter to Milton Vargas, as quoted in Flusser (1987), 142.
¹⁷ Flusser (1987), 142, 146.
liquid media in the benthic environment of the deep sea, I consider how the ocean environment changes the conditions of knowledge production. Beyond Clement Greenberg’s medium specificity, or the relation of art to the unique nature of its medium, thinking with the ocean requires a philosophy that focuses on both the materiality of the environment and the perceiver attuned to it as conditions for thought.\textsuperscript{18} What I term \textit{milieu-specific philosophy} proceeds from the technique of critical displacement: \textit{how would the conditions of knowledge about (x) change if you were to displace or transport it to a different environmental context?} Such a practice evolves from and goes beyond the media-specific analysis we see in \textit{Towards a Philosophy of Photography}, stepping back from the technology itself and instead turning to the epistemological consideration of how thought emerges in relation to both body and environment. Instead of taking “inscription” as the primal scene of media theory as Flusser does in \textit{Vampyroteuthis Infernalis}, I consider a more aquatic vocabulary of material historicity—washing, spilling, warping, residue—the qualities of what photographer Jeff Wall calls “liquid intelligence.”\textsuperscript{19} The question we should be asking ourselves after reading \textit{Vampyroteuthis} is this: under what conditions have terrestrial knowledge structures evolved, and how would they appear radically different in an aqueous environment from the perspective of the vampire squid?

\section*{2.2 Situating Flusser’s Vampire Squid}

While the vampire squid may seem an unusual vessel for media and cultural theory, Flusser’s biographical history sheds some light on the key issues informing its genesis.\textsuperscript{20} Vilém Flusser was born in Prague in 1920 into a family of Jewish intellectuals. He studied philosophy at the Charles

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\textsuperscript{18} See Greenberg (2003), 773–779.
\textsuperscript{19} See Wall (2007), 110.
\textsuperscript{20} For a more detailed biography, see Finger et al. (2011).
\end{flushleft}
University in Prague and in 1939 emigrated with his wife Edith to London to continue his studies on communication and language. Within the next year, his remaining family in Prague was deported to concentration camps, and in Buchenwald, Auschwitz, and Theresienstadt they were murdered. In 1941, Flusser and his wife left London and moved (migrated, escaped) to Sao Paolo, Brazil, where they stayed for the next few decades. The violence of the Holocaust, the abrupt loss of his family, the sudden need to learn Portuguese, and process of adapting to Brazilian culture would inform his later writings. These challenges appear explicitly in *Freedom of the Migrant*, which explores the simultaneous suffering and positive openness to change available to the emigrant: “to be unsettled, one first has to be settled.”

The questions that arise in Flusser’s media theory—technology and possibilities of freedom, the historical shift between writing and technical images (or history and what he calls posthistory)—respond to some of the worst events of the twentieth century, as they are deeply concerned with fascism, genocide, and the power of early communications systems such as radio and film. Sensitive to future changes in the global possibilities of communication, Flusser’s writings on photography consider how technological shifts in communication might change the possibilities for human relationships: in the best possible world, media would cease to be a one-way, totalitarian system, emanating from a single source to a silent receiving audience, and would instead facilitate dialogue between receivers and senders. Flusser imagines modifications of television as something like a proto-Internet: if only television viewers could also send messages (or images) to one another. This is early media theory; as Alexander Galloway and Eugene Thacker argue, interconnection is not an automatic guarantor of freedom because it makes both

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21 See Flusser (2013).
networked entities vulnerable, and, quoting Gilles Deleuze, “the quest for ‘universals of communication’ ought to make us shudder.”

Flusser argues that historical consciousness shifts with the emergence of two specific technologies of communication: the invention of writing (a shift from prehistoric to historic) and the invention of photography (a shift from historic to posthistoric). In this schema, prehistoric consciousness assumes a one-to-one relation between world and image. The function of the image is to refer to reality: “Prehistoric images (from cave paintings to proto-historical wall paintings) are maps that enable their addressees to orient themselves in their environment.” Historic consciousness emerges with the advent of writing, a linear technology that does not simply refer to a preexisting reality but shows how things came into being: “Linear texts explain images, they roll out their scenes into processes, and they order things into irreversible chains of causality. The environment can be causally explained and progressively manipulated.” Images like “church windows, columns, or oil paintings,” also have an explanatory function but are on the decline because “all models of perception and behavior can be found in texts.”

If prehistoric consciousness is static and historical consciousness is linear, then posthistoric consciousness is the fragmentation of the line into a designed image. Flusser writes that photographs are “only the first of these posthistorical images,” not surfaces but rather “mosaics” composed of “dot elements” like the molecules in silver compounds. Visualization refers to the ability to “turn a swarm of possibilities into an image.” For Flusser, creating photographic images involves a process of calculation rather than imagination, because the

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22 See Galloway and Thacker (2007), 23. Galloway and Thacker discuss communication-as-vulnerability in terms of technology, but the same logic could be analogized to agricultural monoculture, which enables single diseases to wipe out entire crops.
23 Flusser (1987), 126.
24 Flusser (1987), 127.
26 Flusser (1987), 129.
photographer must consider settings and adjustments of the apparatus. Thus photographs (or “technical images”) are not Platonic copies of reality but structurally “projects.”

Although photographs are popularly considered as part of an archive of the past, Flusser argues that photographs are future-oriented because they are images (“models of perception”) yet to be seen by viewers. In this way, photographers act science-fictionally upon the present to “project a potentially alternative future.” This is similar to the argument that Jacques Derrida makes in *Archive Fever*, where the archive is not about recording the past but always already directed toward its future use: “the question of the archive is not, we repeat, a question of the past. It is not the question of a concept of dealing with the past that might already be at our disposal or not at our disposal, an archivable concept of the archive.” Extending Derrida’s argument further, we might say that something “posthistoric” about earlier archives (curiosity cabinets, libraries) cybernetically feeds forward to future viewers and that Flusser positions posthistorical thinking within a schema that is itself historical because of the way it periodizes prehistoric, historic, and posthistoric thinking according to a logic of sequentiality (pre-, post-).

Yet, more compelling than his schema of historical periods, Flusser’s discussions of posthistory address the cultural practices emerging with cybernetics—a question of media and photography but also of biotechnology. In a series of letters exchanged with his close friend Milton Vargas in 1981, Flusser writes that whereas evolution suggests a linear perspective on the emergence of species, genetic engineering “leaps over phylogenetic barriers and exchanges information from distant ‘branches,’” and “it will end up creating organs and organisms” turning the phenomenon of life informatic and cybernetic. Here, “the challenge is not biological but

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27 Flusser (1987), 129.
28 Flusser (1987), 130.
epistemological; to rethink evolution not in ‘causal’ terms or ‘finalistic’ terms, but in ‘programmatic’ terms.” Genetic engineering means rethinking evolution not as a line but in programmatic terms of splicing and reordering genes; “program” is a “a combination game with clear and distinct elements,” a definition that allows Flusser to consider genetics, photography, and posthistory writ broadly in commensurable terms.

The vampire squid embodies such a relation between genetics and media technology. Flusser views genetics as a kind of combinatorial program, where human and cephalopod are both “variations of the same game played with the calculi of genetic information that programmes all terrestrial life.” The underlying metaphor treats genetics as computation, where each individual is an actualization of one possibility of evolution. This is similar to Flusser’s writings on photography: each photograph is not the product of an artistic genius but merely one actualization of possible images configurable within the camera apparatus. One criticism we should make is that, unlike the camera apparatus, the “genetic program” of organisms is not part of a closed system. For example, the entire field of epigenetics studies how extragenetic or environmental factors influence the development of an organism. Even given identical DNA, individuals develop differently over a lifetime.

However, the vampire squid fable requires that we consider evolution to be an apparatus that realizes itself along different trajectories, the human one on land, the vampyroteuthic in the abyss: structurally parallel but in an exaggerated fictional dialectic. Flusser writes, “Their conches

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32 Flusser (2000), 84.
33 Flusser (1987), 23.
35 One artistic work that illustrates this is Natalie Jeremijenko’s project One Tree, in which 1,000 fruitless walnut trees were cloned from one tree’s tissue, then planted in pairs around the San Francisco Bay Area, each pair developing in response to its microclimate and locale. See Natalie Jeremijenko, “One Tree(s),” Inspiration Green, n.d., http://www.inspirationgreen.com/natalie-jeremijenko.html.
are our fish, their snails are our birds, their cephalopods are our mammals, and the several octopi, edible or not, are our Neanderthals and Heidelbergenses.”

In a move both serious and surreal, Flusser asks us to consider the evolution of intelligence in the molluskan phylum as parallel to that of Homo sapiens as the former moves from the conch to the snail, cephalopod, octopi, and finally—at the pinnacle or nadir, however you have it—vampyroteuthis. In this way, the biological and technological are both kinds of “apparatus,” which Flusser defines as “a plaything or game that simulates thought” or an “organization or system that enables something to function.”

His translator, Anthony Mathews, defines Flusser’s understanding of an apparatus as, “An overarching term for a non-human agency, e.g. the camera, the computer and the ‘apparatus’ of the State or the market.”

Against photography, the vampire squid is a kind of “anti-apparatus.” The term comes from Flusser’s essay “Criteria—Crisis—Criticism” (1984), in which he discusses the possibility of a new kind of photography criticism that does not focus solely on selecting which photographs are good or beautiful. Rather, a new photography criticism is needed that critiques the criteria by which we judge photographs, a criticism that also critiques the apparatus’ functions. Flusser writes, “Therefore, it is first necessary to invent an anti-apparatus” that has to “critique the entire apparatus of culture and all its totalitarian tendencies, including the apparatuses that program us.” The vampire squid in Vampyroteuthis Infernalis is precisely such an anti-apparatus, used to make the cultural contexts of photography visible.

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36 Flusser (1987), 46.
37 Flusser (2000), 83.
38 Flusser (2004), 49.
39 Flusser was researching and writing about the vampire squid two years before the publication of Towards a Philosophy of Photography, as evidenced by letters he wrote to Milton Vargas in 1981, excerpted in Vampyroteuthis Infernalis, 129–142.
2.3 Vampyroteuthis Infernalis as Photographic Fable

In *Vampyroteuthis Infernalis*, taxonomy serves as a storytelling structure for the vampire squid’s fictional relationship to the human. Although this is a fable, it has no traditional plot with rising action and a climax: the text reads like a scientific report about the vampire squid, which the reader can recognize as fictional mainly through oblique self-reference and hyperbolic content. Instead we could say the climax(es) of the fable are the moments when vampyroteuthis breaks through as the refracted image of (1) humanity, (2) photography and the photographic apparatus, or (3) posthistory broadly.

The abyssal environment offers a compelling structural parallel with the photographic darkroom. Consider the similarities: the darkroom and the abyss are places of sensorial estrangement (for humans) where our visual modes of perception are compromised. In the darkroom, only a red/red-orange light illuminates space to avoid disturbing the sensitive photographic paper. From the shallow pools of chemicals rise the hellish smells of sulfur and vinegar. To these pools we bring our negatives, miniature scenes captured from the camera’s world, that we then project and affix to photographic paper. After bathing the paper in the pools of chemicals, images slowly reappear. There is something primordial about the darkroom and also something vampyroteuthic about the way in which light and liquid chemicals combine to produce images—images that are themselves entirely structured by the apparatus of the camera and all of its “glandular appendages”: the lens; the chromatophore-like shutter, opening and closing to change how light and color reflect; the enlarger that flickers light onto chemically-sensitized paper; the liquid baths that secrete photographs.\(^{41}\) Looking at photography

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\(^{41}\) Many thanks to Whitney Trettien for this colorful observation, which she offered in her response to my presentation “Vampire Squid Media” at a November 2013 graduate colloquium sponsored by the Duke University Program in Literature.
vampyroteuthically means seeing photographs not only as inscriptions of light but as the “secretions” or “precipitate” of the liquid bath itself.

The abyss presents the cognitively estranging conditions that enable Flusser to develop a theory of information that depends not on the inscription of information on objects but on subjects. In a chapter on “Vampyroteuthan Art,” Flusser considers how inscription on stone tablets would not last underwater but be eroded away or used by other organisms as a surface on which to grow.\(^{42}\)

This human trust in the permanence of the objective world seems derisory from the point of view of those who, like Vampyroteuthis, inhabit a liquid environment. From this point of view, the only material for information storage that is worthy of trust is the egg. Genetic information is \textit{aere perennius} and will outlive not only all books, buildings, and paintings but also the species itself, although in mutated form.\(^{43}\)

Think about what seawater does to objects: it rusts metal, dissolves paper, and allows barnacles and other organisms to attach to hard surfaces like ships and stones.\(^{44}\) The ocean is not a generic fluid but an environment of particular chemical composition, what Michel Serres (following Jules Michelet) calls “the soup” of life, full of microscopic organisms, larvae, detritus, and dissolved minerals.\(^{45}\) The ocean erodes external objects like “books, buildings, and paintings,” countering trust in the “permanency of the objective world.” If information could last

\(^{42}\) This question of how an underwater species would develop means of preserving history is not only science fictional but figures into many nature documentaries. “Aliens of the Deep Sea” (2010), for example, laments the fact that octopus mothers die before their young hatch, preventing members of an otherwise highly intelligent species from passing down the knowledge gained during their lifetimes. See “Aliens of the Deep Sea,” \textit{The Nature of Things}, season 49, episode 28, directed by Jérôme Julienne and John Jackson, 2010, http://www.cbc.ca/natureofthings/episodes/aliensof-the-deep-sea.

\(^{43}\) Flusser (1987), 105.

\(^{44}\) Filmmaker David Gatten literalized a kind of water-writing in his work \textit{What the Sea Said}, where he submerged 16mm film for two weeks, taking the ocean as a coartist in the production of celluloid inscriptions.

\(^{45}\) Serres (1982), 29–38.
underwater, Flusser imagines, then the substrate or media would have to be genetic material—notably, imagining information storage at the level of the germ line rather than the brain.

Flusser describes the desires of the photographer and vampire squid in strikingly similar terms. Compare the following passages from *Philosophy of Photography* and *Vampyroteuthis Infernalis*:

Photographers’ intentions are] first, to encode their concepts of the world into images; second, to do this by using a camera; third, to show the images produced in this way to others so that they can serve as models for their experience, knowledge, judgment and actions; fourth, to make these models as permanent as possible. In short: Photographers’ intentions are to inform others and through their photographs to immortalize themselves in the memory of others.46

With this artistic creation [i.e. the squid’s modulation of its skin pigmentation] we are able to distinguish between several phases. (1) Vampyroteuthis goes through a particular experience. (2) He searches in his memory for a suitable model in order to capture it. (3) He verifies the absence of this model: the experience is as yet unexpressed. (4) This arresting experience goes beyond his organism, is organised by the brain and then transmitted to the chromatophores. (5) The chromatophores transcode the experience into a “skin painting”. (6) Such colouration never before seen provokes the curiosity of another Vampyroteuthis. (7) The sender uses the new colouration to seduce the receiver and copulate with it.47

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46 Flusser (2000), 46.
The ways photographers and vampire squid deliver information to the “other” share a similar process of first having a concept/experience, then desiring to transmit it, then encoding it in an image, and then transmitting it so as to immortalize the image in the memory of others. Drawing this parallel between Vampyroteuthis and Towards a Philosophy of Photography suggests that the liquid “vampire squid media”—skin paintings and sepia ink clouds—stand in place of photographs, as all are nondurable images.

Flusser also draws a parallel between vampire squid skin and photographic paper. He writes, “What fascinates the photographer is not the photographic paper, the object, but the information transmitted. The photographic paper is for the photographer what the skin is for Vampyroteuthis: a medium for colorful messages.” The vampire squid itself is thus both photographer (inscriptor) and photograph (medium), using its bodily tissues and fluids to produce deceptive images that fascinate other vampire squid. Although Flusser claims (in his chapter on Vampyroteuthan art) that the vampire squid models “directly on the other,” not on objects, we quickly see that the squid’s own body facilitates the communication of messages via chromatophores, or skin pigment cells, and ink clouds. This reflects a shift from a society of subjects who “imprint information on objects” to subjects who become information programmers.

Flusser wrote Vampyroteuthis from 1981 to 1987, when not much was known about the vampire squid, and he makes several significant errors in its characterization. For example, Vampyroteuthis grows to only about one foot in length, not (as Flusser erroneously writes) 20

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49 This fascination with squid ink may also remind us of China Miéville’s novel Kraken (2010) and its fictional religion based around squid, with holy texts written in teuthic ink.
50 In characterizing vampyroteuthis, Flusser likely drew from knowledge of other cannibalistic cephalopods, such as the Humbolt squid (Dosidicus gigas), which swim in schools and have a reputation for being extremely violent.
meters. The vampire squid has both black and reddish-brown chromatophores but cannot change its skin color like other cephalopods can. It also does not secrete sepia ink to escape, as dark ink would be redundant in the abyss. Thus, instead of the two media Flusser assumes (skin paintings and ink clouds), the “real” vampire squid has light-producing organs called “photophores” on the tips of its webbed tentacles and produces a bioluminescent mucus (instead of an ink cloud), which it can excrete to distract predators. Had Flusser known of photophores, he might have considered these photo-graphic media (playing with light) to have offered a more compelling analogy with the camera and photographic technologies.

These details aside, within Flusser’s fable the purpose of ephemeral media (ink clouds and skin paintings) is secondary when compared with the ultimate goal: copulation, the moment of contact where messages may be inscribed on the egg, “the only material for information storage that is worthy of trust.” The vampire squid’s single objective is to trick another vampire squid into becoming fascinated with its ephemeral media, in order to have sex with it: “The sender uses the new colouration to seduce the receiver and copulate with it.” Further, “Vampyroteuthis is fascinated by the effect that the modeled [sepia] cloud will have upon another Vampyroteuthis. . . . The aim is to inform the other, to alter him, to impose on him particular information, knowledge, behavior and sensations.” That the vampire squid, the most intelligent animal in its phylum, would aim to “alter the other” and “impose” its own information on others of its kind should alarm us as a particularly violent form of depersonalization. Here it figures as a kind of “reverse” vampirism, of pumping a substance into others rather than sucking it from

them. Especially disturbing, particularly because Flusser genders the squid as male, are the connotations of “raping the mind” that Joost Meerloo points to in his 1956 discussion of menticide and brainwashing: “[Vampyroteuthis] seeks to seduce and violate his mates so that these may store the information without critique.”56 Further, “in order to be informed it is the other that has to be violated. The other’s memory is for Vampyroteuthis the same as stone and language are for us. . . . He hammers and composes the other.”57 The sexual politics of imagining—even in fable—that “genetic memory as information storage” would be modifiable only through the vulnerable moment of sex between squid, and that the sex of the inscriber is male (Flusser calls the vampire squid “he”), should not be let off the hook as a simple reflection of reality. We should ask why this model of sexuality finds itself reinscribed in Flusser’s narrative rather than challenged and questioned.58

One response is to turn to the gendering of photography and the transition from a society that favors inscription on objects to inscription directly on subjects. Take, for example, Roland Barthes’s phallic theory of the “punctum” in Camera Lucida to describe the way a photograph strikes and fascinates the viewer. Distinguishing it from the “studium” (“of the order of liking” a “vague, slippery, irresponsible interest one takes”), Barthes writes that “punctum” is the “sting, speck, cut, little hole—and also a cast of the dice. A photograph’s punctum is that accident which pricks me (but also bruises me, is poignant to me),” often a specific detail of the photograph.59 This formulation, predicated on a kind of visual injury, reminds us of the way the vampire squid

58 Thinking photographic and sexual reproduction together might suggest Joel Snyder’s essay, “What Happens by Itself in Photography?” in Pursuits of Reason: Essays in Honor of Stanley Cavell, ed. T. Cohen et al. (Lubbock: Texas Tech, 1993), 364. While Snyder provocatively alludes to the womb-like dark of the camera’s interior as a matrix for creating photographs agentially directed by both the photographer and something else, my concern with Flusser’s discussion of photography and sexuality has more to do with the rapist and totalitarian connotations of the vampire squid transmitting memories on others through sex.
59 Barthes (2010), 27.
also seeks to strike and fascinate the viewers of his skin paintings. Flusser considers the camera as masculine agent in *Towards a Philosophy of Photography*:

If one observes the movements of a human being in possession of a camera (or of a camera in possession of a human being), the impression given is of someone lying in wait. This is the ancient act of stalking which goes back to the paleolithic hunter in the tundra.\(^{60}\)

Flusser’s gendered depiction of the vampire squid engages an existing tradition of critical thought connecting the camera with a masculine, penetrative logic; for example, Susan Sontag’s and Donna Haraway’s extensive discussions of the gendered parallels between guns and cameras, their relation to capture through the “click” of a trigger.\(^{61}\)

Flusser’s question—“Will then the vision of vampyroteuthian art necessarily be the vision of our own immediate future?”—suggests both a recuperative and dystopic vision: becoming vampyroteuthic means gaining a kind of individual agency against the surrounding climate of media by programming others.\(^{62}\) Yet the recovery of our individual agency comes at a cost. Specifically, agency can be recovered only by belonging to a society where vampyroteuthic media are predicated on deception and lies. Is this future on the immediate horizon?

Our communicational structures are being fundamentally transformed, in the sense of becoming constituted by ephemeral and transient media that allow the other to be informed without the need for objects. It is as if humanity, after a multi-millennial turn through the objective world, had now reencountered the vampyroteuthian path.\(^{63}\)

\[^{60}\text{Flusser (2000), 33.}\]
\[^{61}\text{See Sontag (1973), 13–15; and Haraway (1989), 26–58.}\]
\[^{62}\text{Flusser (1987), 115.}\]
\[^{63}\text{Flusser (1987), 113.}\]
Society becomes vampyroteuthic as human-made media move into an aquatic paradigm of
informatic “flow” programmed to influence human behavior: “the society of the immediate future
shall be a society of information consumption, less and less interested in the consumption of
‘goods,’ of objects. The interest diverted from economy to sociology. Intersubjective society: a
society of Vampyroteuthes.”64 In this moment the “underwater media” specific to the vampire
squid turn into a commentary about memory and an emerging information society. Flusser writes,
“Vampyroteuthis is always a ‘total artist’, that is, one who seeks to attain immortality through the
epistemological, aesthetic and ethical modeling of the other.”65 Through its concern with
inscription on the other, Flusser’s “art of the vampire squid” is a fable about totalitarian media, of
being forced to carry someone else’s memory or experience like a tattoo.

Vampyroteuthis thus embodies both a kind of totalitarian power (seeking to inscribe its
memories on others) and resistance to this same power (taking the role of the
inscriber/programmer instead of the inscribed). In a letter from 1988, Flusser’s friend Vargas
responds to Vampyroteuthis by comparing it to Nazi fantasies of a possible superman (here,
“super-mollusc”) and Star Wars: “The fact is that both you and [Louis] Bec, as well as the TV
producers, are on the trail of the primitive Nazis on the fantastic search for ‘new forms of being’.
For now, thank God, this is fantasy, but gene technology threatens to turn it into reality
(concrete).” Vargas writes that Vampyroteuthis is like the “Emperor” or “Darth Vader,” urging
Flusser to think of “the biography of an animal as powerful as Luke Skywalker or Obi-
something-or-other that has the light side of the ‘force.’”66 Flusser defends his organism, arguing,
“when fantasy loses its exactness it becomes banal (I don’t know Skywalker, but I imagine him to

64 Flusser (1987), 114.
65 Flusser (1987), 111.
66 Flusser (1987), 145.
be a lot less fantastic than, say, the pseudo-social organization of ants)." Here I have to side with Flusser, given that the characters in the Star Wars universe are, with a few exceptions, hominoid or at least bipedal. Ant colonies and the vampire squid interest Flusser because of the (to borrow Darko Suvin’s phrase) “cognitively estranging” forms of perception they offer—forms that participate in a broader epistemological project of deprivileging both human perspective and the “objectivity” of machines.

2.4 Speculative Fiction and Epistemic Practice

As much as Vampyroteuthis is about photography and posthistory, it is also about the imagination and exploration of points of view—the same qualities Flusser finds redeeming about photography. Here, the possibilities of freedom relate to photography’s ability to realize many points of view rather than one transcendent one: “The act of photography is that of ‘phenomenological doubt’, to the extent that it attempts to approach phenomena from any number of view points.” In a way, Flusser takes the vampire squid as a kind of “camera” of the deep to realize as many phenomenological viewpoints as possible from the vampire squid’s standpoint (floatpoint?).

Flusser imagines the perceptual world of the vampire squid with a generosity that is not at all vampyroteuthic. Opening the possibility of milieu-specific philosophy, he considers the epistemological influences of the deep sea and the vampire squid’s uniquely evolved body in rigorous material and phenomenological detail. Thus, as much as Vampyroteuthis Infernalis is a fable about photography, it is simultaneously (and nonexclusively) speculative fiction that takes

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67 Flusser (1987), 146.
68 I will argue for an understanding of SF as the literature of cognitive estrangement.” Darko Suvin, Metamorphoses of Science Fiction (New Haven: Yale, 1979), 4.
69 Flusser (2000), 38.
seriously the conditions of the ocean as a novel and cognitively estranged starting point for philosophy. That Flusser takes seriously the media (ink clouds, skin paintings) of the vampire squid suggests a theory not focused on stable objects or ontology but on the comparative epistemology between human media and vampyroteuthic media. This requires us to move beyond Vampyroteuthis as photographic fable toward the beginning of a practice of milieu-specific philosophy, which considers how specific environmental conditions of alterity make visible the assumptions in our terrestrially born concepts and orientations to the world. The vampire squid opens a way for elaborating a theory of media that takes seriously the conditions of seawater as a space for communication and relation.

Early in Vampyroteuthis, Flusser offers a strong critique of the possibility of a transcendental point of view: “There is no ‘general world’ or ‘objective universe’ which is common to both [human and vampire squid]. Such an abstract world of science does not exist. If we find Vampyroteuthis, it is within our world that we find him. We do not find him as existence, but as object.” Flusser positions his fable to “implicate” the reader in the world of the vampire squid, breaking the fourth wall (camera lens, aquarium glass) between viewer and viewed:

… we shall not dive into the depths with the aim of explaining anything, but with the aim of implicating ourselves in the vampyroteuthian situation. As we cannot observe the depths through phenomenological methods (we do not know how to dive into the oceans), we shall aim to do it by an intuitive method (diving into Vampyroteuthis). And as we assume, therefore, his point of view upon his habitat that is planet Earth, at the end, we shall be surprised to observe that Earth becomes even stranger than Mars or Venus.

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70 Flusser (1987), 73.
71 Flusser (1987), 66.
“Diving into vampyroteuthis” presents a methodology for estranging our view of earth and terrestrial habitation, a “philosophy of fantasy” that Flusser imagines might become a discipline “as rigorous as phenomenology.”72 Part of Flusser’s methodology involves using metaphor to imagine the vampire squid’s phenomenological world from the complexity of its particularly evolved body, proprioceptive orientations, and the benthic conditions of its aquatic milieu (pressure, temperature, buoyancy). Recognizing that the vampire squid is “literally facing a different world” allows us to “see with his eyes and grasp with his tentacles.”73 Metaphor, after all, is about transference from world to world: “We are leaping from a habitual world to a fabulous world. It is a world that is not apprehended and comprehended by hands, as is ours, but by eight tentacles.”74 Differences in bodies (vertebrate, mollusk) would lead to different intuitions of the world.

Comparing the ocean with land, Flusser infers that the vampire squid would have a volumetric rather than planar experience of space. In humans, Flusser writes, “Bipedal stride, with both arms like pendulums, divided the world into past, present, and future.”75 Spatial theorists like Yi-Fu Tuan have also commented on the way the human body provides a reference point for spatial intuitions. Tuan draws detailed diagrams in his foundational work, *Space and Place*, which discusses types of space (sacred, profane) around a human body, dependent on its front, back, and sides.76 Whereas our vertebrate physiology is like that of a “coat hanger,” with shoulders and spine standing up in response to gravity, “the spiral is the fundamental theme of the

73 In modern Athens, public transportation vehicles are called metaphorai. “To go to work or come home, one takes a ‘metaphor’—a bus or a train. Stories could also take this noble name: every day, they traverse and organize places; they select and link them together; they make sentences and itineraries out of them.” Michel de Certeau, *The Practice of Everyday Life* (2002), 115.
75 Flusser (1987), 73.
76 Tuan (2001), 34–50.
molluscan organism,” a position responsive to a buoyant liquid environment. As vertebrates, “our dialectic is linear,” while the vampire squid’s “is coiled. We think ‘straight’, and he thinks ‘in a circle’. . . . That is because our world is a plane and his is a volume.” Further, vampire squid are “whirlpool animals” with “coils that tend to uncoil. They are springs that tend to stretch, fists that tend to open up into flat palms. . . . As they uncoil, they release the accumulated energy of the spring. This may explain their extraordinary ferociousness.” The vampire squid’s experience of space would thus not be Cartesian but “a twisted tension sustained by an external spiral shell.” Thus “it would be a mistake to think that we exist on the ‘same Earth.’ We exist on an Earth that is a habitable surface. He exists on an Earth that is a habitable hole.” Human senses of space proceed from surface-habitation, vampyroteuthic senses of space from life in a volume. Further, the vampire squid “perforates the third dimension just like a screw.”

Comparing the way “we think in a line” with how the vampire squid “thinks in a circle” or moves in a spiral should remind us of Flusser’s schema for history (line) and posthistory (broken line, programming). The “spiral” figure of the vampire squid presents a way for thinking the nonlinearity of posthistory related to a variety of phenomena, including the camera apparatus and the temporality of genetic engineering.

Flusser also connects the vampire squid’s physiological posture (consider a bulbous body on top of a thin umbrella of skin) to different behavioral and cognitive tendencies, such as the predisposition for aggressive movement. Running through every chapter in *Vampyroteuthis*

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77 Flusser (1987), 43.
78 Flusser (1987), 78.
79 Flusser (1987), 40, 42.
80 Flusser (1987), 78.
81 Flusser (1987), 79.
82 Flusser (1987), 78.
Infernalis is a deep fascination with psychoanalysis, of the vampire squid’s unconscious as the photographic and moral negative (Other) to ours. Take the following passage:

Our conscience is the vampyroteuthian unconscious, and vice versa. This is reflected in our respective postures: the position of our head corresponds to the position of his belly.

If Vampyroteuthis analyses the world, he is doing “depth analysis,” and if he analyses his own being in the world, he is doing a “critique of reason.” His Newton is Freud and his Jung is Einstein.83

This surrealist image—that our heads are anatomically in the place of the squid’s belly—may remind us of the famous cover of Georges Bataille’s Acéphale, evoking the way in which the human subject of analysis thinks and/or acts according to the belly/libidinal zone.84 Through inversions such as this, Flusser positions the vampire squid as not the simple “opposite” of the human but as a kind of photographic negative of the human, the image that makes the human appear under the chemical fixing fluids of fiction.85

By considering the relation between the vampire squid’s physiological and cognitive orientations to the ocean, Vampyroteuthis evokes and extends George Lakoff and Mark Johnson’s observations in Metaphors We Live By from humans to a speculative technique applicable to other animals and machines. Lakoff and Johnson use linguistic evidence to show that the way we ordinarily speak is highly metaphoric, and these metaphors both structure cognition and correspond to a broad range of physiological and environmental circumstances, such as gravity, bilateral symmetry, vertebrate posture. Lakoff and Johnson are keen to point out from their

83 Flusser (1987), 77.
84 Even in textbooks such as Invertebrate Zoology: A Functional Evolutionary Approach, ed. Edward E. Ruppert, Richard S. Fox, Robert D. Barnes, (Belmont, CA: Thomson-Brooks/Cole, 2004), the physiological axes have to be flipped for cephalopods. For example, what for vertebrates is the dorsal side becomes the “back” of the squid; what is ventral becomes the “front.”
examples that metaphors often logically contradict one another. Thus there is no overarching system, but rather meaning generated through use. One example of terrestrially based metaphor has to do with what Lakoff and Johnson call “orientational metaphors” and the values we attach to directions. Consider the metaphor “happy is up” and “sad is down.” For example, “I’m feeling up,” “that boosted my spirits,” or “my spirits rose,” compared with, “I’m feeling down,” “I fell into a depression,” or “my spirits sank.” Here, standing up is a sign of health, activity, and well-being, and the human body lying down tends to be a sign of sleep, illness, lethargy, or death. Part of Flusser’s contribution to milieu-specific philosophy is to extend Lakoff and Johnson’s theorizations about human cognition and metaphor to the vampire squid in its aquatic environment, providing the foundation for a comparative epistemology between human and vampire squid and speculative technique.

The speculative technique of considering embodiment, metaphor, and cognition reformulates Thomas Nagel’s classic philosophical problem, “What is it like to be a bat?” Nagel focuses on “qualia” and whether we can really know the world of the bat, which takes human-developed science as a transcendental point of view. In contrast, Flusser imagines the perceptual world of the vampire squid in order to develop an epistemic check on human objectivity, denatured “from the molluscan point of view.” The end goals are thus quite different: for Nagel, to try to know the experience of the animal from the disembodied I/eye of science; for Flusser, to take the aquatic animal as a kind of critique of the disembodied I/eye, making human and

86 For the cephalopods, “up” and “down,” because of water’s buoyancy, might not have the same values they do for human beings. Instead, cephalopods might attach value to differences in water pressure, water temperature (or a temperature border such as the thermocline), light, or scent.
87 See Lakoff and Johnson (1980), 14.
88 Although one could think of other examples, such as “put my name down for that” or “let’s get down to business,” these simply derive from different situations—that of writing a name on a list or a metaphor for commitment and work.
90 Flusser (1987), 27.
terrestrially developed concepts seem strange from the vampire squid’s point of view. We might apply Flusser’s own perverse reading technique of displacing “photography” with “vampire squid” to one of his own quotations: “The act of photography [the vampire squid’s perspective] is that of ‘phenomenological doubt’, to the extent that it attempts to approach phenomena [humanity] from any number of view points.”91

The milieu-specific exercise of attending to the environmental and embodied conditions that have structured our cognition implies that human categories of perception might not be the only ones, or the most adequate ones, with which to understand phenomena in the world. Flusser calls this skepticism “biological Kantianism,” or the idea that each sensing organism might have its own set of “categories” through which it perceives the world. This idea is strikingly similar to Jacob von Uexküll’s theory of Umwelten, or perception-worlds, that take individual animals as loci of perception-worlds that are qualitatively different from one another. Uexküll writes, for example, that the tick is really only sensitive to three “perception marks”: warmth, light, and the scent of butyric acid, a chemical present in animal sweat. The tick’s perceptual world is defined by the presence or absence of these three things, whereas another animal would notice a different range of sensations. Thus, “there is no space independent of subjects. If we still want to cling to the fiction of an all-encompassing world-space, that is only because we can get along with each other more easily with the help of this conventional fable.”92 Rather than one World, we must now consider worlds. Although Uexküll argues that the animal’s environment is “only a piece cut out from its surroundings,” which are “our own human environment,” with Flusser our own human environment is not the container of all the other animal environments but one of many perspectives: “biology is itself a product of the human ‘web’. It catches everything in the

91 Flusser (2000), 38.
92 Uexküll (2010), 70.
categories of theoretical reason, including reason itself, and not only the spider’s web. The biologically-biased Kantianism does not resolve the problem, it only transfers it to another level.**83** That is, the study of biology (physiology, morphology, marine science) provides the means of intuiting an animal’s *Umwelt*, but biology itself is created from (and according to) human sensibilities of measure. Although Flusser sees no outside to this Kantian problem, the vampire squid imagined in the abyss opens toward questions of milieu-specificity: that is, how knowledge and concepts follow from particular embodied viewpoints that in turn respond to materially specific environments. The cognitively estranging point of view of the vampire squid in the abyss brings into relief the terrestrial conditions (gravity, planar space, reliance on vision) that inform specific concepts and points of view we take for granted. However, sometimes these concepts can be read back into the fable to show its own construction. As with Flusser’s Kantian problem, the fable shows us not alterity but a refracted view of ourselves.

*Vampyroteuthis Infernalis* both succumbs to and sets up the conditions for a critique of the terrestrial bias of media theory and philosophy. By imagining the medial conditions of the deep sea, it helps *pluralize* rather than supersede the points of view through which we might approach and develop concepts. Yet it also imagines media in dry terms rather than the messy, turbulent movement of fluids. In the final section of this article, I address one concept—inscription—to show how the dryness of terrestrial theory persists within Flusser’s vampire squid fable and (following photographer Jeff Wall) the technology of photography as such. I suggest that *milieu-specific* means thinking with a concept of the “residue” to supplement inscription in media theory, not with the aim of establishing a higher degree of reality but of making tangible the epistemological consequences of the variable environments for thought.

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83 Flusser (1987), 53, 63.
2.5 Liquid Intelligence and the Residue

Towards a Philosophy of Photography entirely—and surprisingly—ignores the agency of the fluid in photographic development. Flusser’s most famous claim—that the program of the camera determines the possibilities of the photographs produced—looks only at the apparatus producing the photographic negative, not the development of actual photographs: “To every photograph there corresponds a clear and distinct element in the camera program.”94 Yet in film photography, every individual photograph depends on development in liquid baths and the unpredictable vagaries of human error/artistry and chemical fluidity. Water notoriously does not obey prescripted instructions—its errant materialitywanders across designated borders (as rivers do), moves around the world turbulently through weather systems, and transforms sunken objects in the ocean with the force of the sea god Proteus.95

This errancy of water—or what Wall calls the “liquid intelligence” of natural forms—is what the camera apparatus has historically sought to control and canalize. In Wall’s provocative critical reading, the “liquid intelligence” of water opposes “the glassed-in and relatively ‘dry’ character of the institution of photography.”96 Whereas liquids flow in turbulent and organic patterns, “the mechanical character of the action of opening and closing the shutter—the substratum of instantaneity which persists in all photography—is the concrete opposite kind of movement from, for example, the flow of a liquid.”97 These elements (liquid and camera) play a role in the photograph Milk, where Wall contrasts the 90-degree angles of the urban environment

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94 Flusser (2000), 68.
95 I choose the term errancy intentionally to evoke its older meaning of wandering and to echo Edouard Glissant’s preference for errancy over nomadism in The Poetics of Relation. See Glissant (1997).
(brick building, cement) with a man crushing a carton, causing milk to spray into the air (Fig. 12).

In an otherwise intentionally ordered photograph, the liquid milk (and the man’s expression, turning away) constitutes the “incalculable” element in the photograph, compelling for the way it evades photographic prescription and control.\(^9\)

In contrast, water “plays an essential part in the making of photographs, but it has to be controlled exactly and cannot be permitted to spill over the spaces and moments mapped out for it in the process, or the picture is ruined.”\(^1\) Thus water is “admitted to the process” of making photographs but also “excluded, contained, or channeled by its hydraulics.”

At the time he was writing in 1989, Wall speculated that digital photography would usher forth “a new displacement of water,” which will “disappear from the immediate production process” such that “the historical consciousness of the medium is altered,” portending an increasingly dry technical consciousness—one perhaps echoed in science fiction film’s imagination of future cities and highly sanitized space stations, where water is invisible beyond decorative functions.\(^2\)

\(^9\) Not all fluids are the same. Consider Stefan Helmreich’s call for a form of theory specific to seawater in “Nature/Culture/Seawater,” (Helmreich: 2011), 132–144; or Gaston Bachelard’s discussion of different kinds of fluids (blood, milk, sweet or fresh water) in poetry in Water and Dreams: An essay on the Imagination of Matter (1942).

\(^1\) Wall (2007), 109.

\(^2\) Wall (2007), 110. Water is involved in all of the major ways that we produce energy; for example, it cools nuclear reactors, powers dams, and is required for hydraulic fracturing. An exception to the general treatment of water in science fiction films is Andrei Tarkovsky’s film adaptation of Stanislaw Lem’s novel Solaris, which takes place on a space station orbiting the (sentient) ocean planet Solaris, a looming presence outside the window portals.
This striking description of photography’s increasing hydrophobia finds resonance with Flusser’s writings. In *Towards a Philosophy of Photography*, Flusser describes posthistoric images in curiously “dry” terms: “Photographs are dams placed in the way of the stream of history, jamming historical happenings.”¹⁰³ This is similar to what Wall writes about the way the opening and closing of the camera shutter is the opposite kind of movement from that of the liquid. Flusser’s vampire squid also aims to control the flows of liquids, but for the purpose of making messages. The messy media of vampire squid (sepia ink clouds, chromatophores, salivary glands, gelatin-secreting glands, and seminal fluid) would seem to be ones not conducive to

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¹⁰³ Flusser (2000), 128.
encoding clear messages, but this is precisely how Flusser imagines them. Consider the vampire squid’s skin paintings, which channel and control the glandular media of communication: an experience “is organised by the brain and then transmitted to the chromatophores” that “transcode the experience into a ‘skin painting.’”\textsuperscript{104} Flusser’s imagination of ink clouds is also about recording a specific memory: “The experience that Vampyroteuthis has just gone through must be expressed in the cloud, no longer with the intention to divert a hypothetical aggressor, but to store this experience in the memory of another Vampyroteuthis.”\textsuperscript{105} That the end goal is to “store” the experience “expressed in the cloud” in the memory of another Vampyroteuthis suggests precise control over the ink cloud, quite unlike Jackson Pollock’s interest in the mathematically unpredictable behavior of fluids. All liquid media are tightly channeled by the Vampyroteuthis; Flusser does not consider the potential for spillage, accident, leakage, bleeding out.

Although we might pause to consider whether chromatophore skin-paintings are more like ink or more like the opening and closing of small apertures, what is important is the question of agency. Flusser presupposes that a single agent (vampire squid or photographer) has an idea or concept and that it “encodes” or inscribes in a medium that then conveys the message to another subject. In this way, Flusser’s vampire squid artist suggests insemination over Derridean dissemination. Whereas “insemination” implies an originary moment of fertilization by a single agent, “dissemination” affirms the “nonorigin,” suggesting the failure of mastery; it also alludes to the impossibility of pre-scribing a message. But if such a thing were possible, “dissemination is precisely the impossibility of reducing a text as such to its effects of meaning, content, thesis or theme.”\textsuperscript{106} In another context, Colin Milburn elaborates the fluid resonances of dissemination as the “movement and overflow of the semantic and seminal from within, the multiplication of

\textsuperscript{104} Flusser (1987), 109.
\textsuperscript{105} Flusser (1987), 110.
\textsuperscript{106} Derrida (2004), 7.
essential meanings and vital fluids,” the spillage, overflow, flooding. This is not the sense of media we see in *Vampyroteuthis Infernalis*, which concerns itself with message delivery rather than a more radical materiality of water. The vampire squid’s desire to tightly control water and glandular media reflects on the institution and apparatus of photography, chained to terrestrially informed media theory based on a concept of tightly controlled inscription rather than the errancy that more materially relates to fluid media. Flusser’s vampire squid thus floats suspended between the “dry” technology of the camera and the “wet” technologies of ink clouds and skin paintings.

To develop a more radical milieu-specificity of fluids, we need a vocabulary beyond “inscription” in the sense of marking on objects, and we need to consider a more distributed sense of agency in communication, a kind of ambient, disseminative production of change and movement. One such moment arises in Wall’s essay “Photography and Liquid Intelligence” when he writes that the liquid chemicals used in photography recall older technologies like “washing, bleaching, dissolving” and the separating of ores in primitive mining, figuring as a kind of “archaism” that “embodies a memory-trace of very ancient production-processes” that are “connected to the origin of techne.” Washing, bleaching, and dissolving all suggest chemically transformative processes that may warp, deform, fray, discolor, cleanse, stain, and saturate surfaces and volumes rather than simply inscribing them with a mark. Returning to this “archaism” of fluid techne and ancient production processes, what we have thought of as history and the material of memory move beyond terrestrial inscriptions, of marks made on objects. From a vampyroteuthic point of view—not a transcendent view but a strange view—history might be thought of in terms of the glandular and transfigurative washes of the residue.

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107 Milburn (2008), 120. Here, Milburn describes the disseminative science fiction horror of the world reduced to grey goo by nanotechnological accident.
3. Database: Proteus and the Digital

3.1 Sea-change

Imagine a theory of media that proceeds from Ariel’s song in *The Tempest* (I.2.396-401):

> Full fathom five thy father lies;
> Of his bones are coral made;
> Those are pearls that were his eyes:
> Nothing of him that doth fade,
> But doth suffer a sea change
> Into something rich and strange.

On a literal level the song is about transformation over preservation; it describes Ferdinand’s supposedly drowned father, whose body has sunk about 30 feet into the ocean (five fathoms) after shipwreck during Prospero’s storm. Although his father is actually alive and well, Ariel’s song misleads Ferdinand into imagining his father’s watery grave. Ariel aestheticizes the drowned-body as becoming treasure, nearly taking the form of a blazon, attentive to not the whole body but its parts: eyes, bones, and their magical and protean transformation. Seawater itself does not change, but is itself the transformative and creative element that reconfigures sunken objects like the body of Ferdinand’s father, an origin lost at sea. As Ian Baucom writes, “The subject becomes part of the fluctuating landscape that encompasses it. Which is not to say that it ceases to exist. For—and this is the crucial point I wish to make—subjectivity, here, endures not a liquidation but a liquefaction. It fades but is not extinguished.”¹ Sea-change “captures the force, physical and metaphoric, of salt-water transfiguring flesh” into enduring yet changing objects.² Seawater asks

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¹ Baucom (1999), 302.
² Mentz (2009), 8.
us to rethink terrestrial notions of the archive as informed by the language of earth and sediment, and instead consider the ocean in terms of seawater’s capacity for protean transformation.

Figure 15: Jason de Caires Taylor, *Underwater sculpture from “Vicissitudes,”* 2013.

Even though the metaphor ‘information is water’ pervades discussions of information technology (ex: data *flows*, one *surfs* the web), the chemical materiality of seawater present in life and in Ariel’s song is largely missing from animations of the ocean in digital media. Here, I use the term ‘animation’ in its older and broader sense of that which ‘brings to life’, rather than a more specific definition of anime/animation as based on a particular kind of technology or machine. For example, Google Ocean is an animation to the extent that it simulates movement through the ocean; the artwork ATLAS *in silico* animates blue particles (representing unique

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3 Lamarre (2009).
protein sequences) into fluid dynamic equations. Many other digital animations imagine seawater as a generic ‘fluid’ rendered transparent like air, a passive medium of frictionless navigation without any of the chemical properties that make it such a powerful agent of transfiguration in life and in the imagination. They also tend to depict the ocean (or its microcosm, the aquarium) as spatial “container,” an expanses to fill with objects rather than the lived space of the ocean that philosopher Michel Serres, referencing Jules Michelet, has described as “the soup.”

In scaling the global ocean down to the size of our computer screen, or scaling seawater up to the point where microbial DNA is tangible, we need to think about the ideological and pedagogical stakes of forgetting the materiality of what we are scaling, and how seawater’s materiality changes with scale. As Jules Michelet writes, scientific analysis of seawater often destroys its object: “Chemical analyses do not explain this characteristic [of the viscosity of seawater]. In it, there is an organic substance which these analyses reach only by destroying it, by taking away from it its special properties and by reducing it violently to the general elements.”

Similarly, properties like the viscosity of seawater are destroyed in the act of digitization. As examples of digital renderings of seawater, I turn to Google Ocean (which scales the ocean down to the size of a computer screen) and the collaborative art installation ATLAS in silico (which scales microbial genomic data up to the size of a projection or cluster of computer screens), asking: in what ways is seawater’s specific materiality lost along the way? Conversely, what might be added or gained by exercises in scaling the ocean? What is a meaningful scale at which to consider seawater? Finally, how might a medium-specific theory of media proceed from the materiality of seawater, such that it considers data as forms in an enlivening and transformative

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4 Serres (1983).
5 Michelet (1864), 52-53.
milieu? I conclude by discussing several aquatic artworks that explore what it might mean to “cultivate” an archive.

3.2 Contexts for a Sea-change in Database Logic

Literalizing the metaphor that “the ocean is a database” (a structured set of data held in a computer) can be misleading because it neglects the different scales at which the ocean can be animated with life. Take for example Grahame Weinbren’s article, “Ocean, Database, Recut,” which collapses the differences between database and ocean, already considered an informational archive. Published in the edited volume Database Aesthetics, Weinbren’s article celebrates the “multilinear” structure of databases over the “linear” structure of most print-based narratives and cinema. Using the fantastical ocean moon (a literal sea of stories) in Salman Rushdie’s novel Haroun and the Sea of Stories as a conceptual example, Weinbren argues that Rushdie’s ocean “fulfills two basic criteria of the database: (1) it is composed of smaller elements, the story currents; and (2) it can be traversed in a multiplicity of ways.” Here, “the elements of the Ocean database are stories,” where, metaphorically, “the swimming user affects the narrative currents and their meaning,” much like choose-your-own-adventure narratives.

This presumes commensurability between three mediums: seawater, narrative, and the digital. Whereas in The Tempest it is the seawater that changes the immersed human, for

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6 Both ‘media’ and ‘milieu’ have long intellectual histories. For ‘media,’ I consider Stefan Helmreich’s definition of media as, ‘substances, channels, or instruments through which forms of action are propagated’ (Helmreich, 2009: 32) and also John Guillory’s connection of media with distance: ‘the enabling condition of mediation is the interposition of distance (spatial, temporal, or even notional) between the terminal poles of the communication process (these can be persons but also now machines, even persons and machines’ (Guillory, 2010: 357). For ‘milieu’, I draw on Georges Canguilhem (Canguilhem, 2001: 6-31), varyingly describes milieu as a ‘fluid intermediary,’ ‘environment of the living,’ and ‘perceptual environment.’ I use the term here to indicate that whatever is ‘stored’ in the ocean contributes to the broader ocean-as-environment, possibly impacting other stored material.

7 Vezma (2007).

8 Weinbren (2007), 66.

9 Ibid., 69.
Weinbren, the “swimming user” is the one that changes the “water” of narrative currents and stories. This inverts a conception of agency, making the user the creative force of organisation, rather than the environment of seawater that we see in *The Tempest*. Instead of animating seawater’s transfigurative materiality, Weinbren’s argument focuses on the structural richness of databases as storytelling structures, where the ocean serves as a convenient conceptual figure or metaphor. This modifies Lev Manovich’s oft-cited argument that database and narrative are mutually exclusive, instead suggesting something more along the lines of Gilbert Simondon’s philosophy—that the database is a sort of “pre-individual” reserve from which narratives might individuate in relation to user choices.¹⁰ Not explicitly tied to an ecological agenda, Weinbren focuses on how the database aesthetic opens more expressive possibilities for interactivity and narrative structure, in which databases present a new way of generating experiential knowledge through the user’s non-linear interactions with the data.¹¹ The ocean simply provides the metaphors that support a pre-existing database aesthetic.

A third “basic criterion” of the database that goes unmentioned in Weinbren’s argument is this: that data persist over time in a stable archive that is identical over repeated viewings; we design digital storage to last as long as possible. Although the *telos* of digital database design is for long and stable life, Wendy Chun has convincingly shown how information in digital storage does not last forever, but has a material life span, degrading over time; we forget that digital media need to be renewed, like the screen refresh, or the way electric current sustains RAM.¹² Chun argues that digital media turn, “the permanent into an enduring ephemeral, creating

¹¹ For more on database aesthetics, see *The Language of New Media* (Manovich, 2002); *How We Think* (Hayles, 2012); *Database Aesthetics* (ed. Vesna, 2007).
¹² Interestingly, Chun turns to watery language to describe new media—that they race towards “the bleeding edge of obsolescence” and that their “slipperiness” is linked to the difficulty of engaging them in the present. See Chun (2008), 184.
unforeseen degenerative links between humans and machines." Ephemerality is thus a quality of digital media made to endure; but in the ocean, ephemerality that *does not endure* is a defining quality of seawater. Thus if the ocean is our model for the database, Weinbren’s third criterion of the database—that data persist in an unchanging form—needs to be rethought. Seawater itself chemically and vivaciously changes submerged macro scale objects, rusting, encrusting, and growing polyps of coral, tunicates, sponges and other free-floating larvae on sunken objects. With the open-system of the ocean, objects do not persist in their original state, but change over time through their immersion in seawater, perhaps like Plato’s sea god Glauces in *The Republic* whose original body image cannot be extrapolated because of its long transformation underwater. Seawater changes what it touches (Fig. 13). If seawater is our model, then the stories in Weinbren’s database would change each other during circulation before a storyteller could draw on them. This is a point that would be clarified by thinking medium specifically with seawater.

The stakes for considering the persistence or decay of objects are both ideological and pedagogical; digital animations (video games, computer animations) often obfuscate lived ecologies. For example, in Nintendo Wii’s *Endless Ocean*, fish do not age or die. Although the game renders light underwater in a very convincing way, it does not integrate principles of change underwater that might modify the landscape, distribution of organisms, growth of organisms. Granted these would be complicated to render, the game nonetheless promotes the conception of fish-as-commodities, collectible and domesticated, and underwater landscapes as unthreatened, stable places. As media theorist Alenda Chang writes, video games have the potential to model more meaningful ecologies: “We need game environments that respond to human agency and yet seem to possess life independent of player actions: this would constitute a

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14 Plato (1991), Book X.
radical but constructive decentering.”

With modifications, Wii’s *Endless Ocean* has the potential to model an ecologically responsive game environment that takes into consideration principles of protean change that are vital to seawater’s materiality.

This article furthers the practice of thinking materially with seawater, making visible the sedimentary logic of the database through considering the medium-specificity of seawater. Thinking with seawater on a macro scale challenges the specific idea of information parsed atomistically as “bits and bytes” in an archive designed to prolong the integrity and duration of inscribed data. It opens to the nearly science fictional conditions of alterity present in the ocean, with seawater functioning as the element of chemical and biological creativity, change. This pushes at the limits of our conceptions of media, asking us not only to critique “media-specifically” as Katherine Hayles has suggested, developing a specific critical vocabulary for non-print media, but medium-specifically. Yet if we consider seawater on a micro scale, its materiality changes: instead of principles of protean change and transfiguration, we see more of a logic of exchange. Thus what I term “medium-specific theory” not only requires that we attend to changes between terrestrial, aquatic, aerial elements, but also changes in scale, for at the level of molecules and proteins (as in the artwork ATLAS *in silico*), abstraction makes possible the commensurability of seawater and digitality. Thinking medium-specifically with seawater means going beyond the broader turn towards “oceanic studies” or the “Blue Humanities,” which shift critical inquiry from the confines of continents to material and historical networks across ocean basins. Beyond this, Stefan Helmreich helpfully suggests that seawater can function as a “theory machine,” a medium whose specificity asks us to reconsider how we conceptualize the materiality

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15 Chang (2012), 15.
16 Hayles (2002).
17 See PMLA (May 2010); Baucom (1999); Mentz (2009); Cohen (2012); Steinberg (2001).
of the archive, instantiated in the environment or in a silicon database. In the following sections, I look at how data visualizations/animations render the materiality of the ocean across macro and micro scales, and how matters of scale determine seawater’s relation to database logic.

3.3 Zooming out: Google Ocean

In the beginning, there was Google Earth. How the Earth got its Ocean goes like this: while at a press conference in Spain in 2006, renowned ocean scientist and National Geographic “Explorer in Residence” Sylvia Earle told the creators of Google Earth that their project was missing something:

... I had a chance publicly to say how much I love Google Earth. “My children, my grandchildren think it is great to see their backyard, fly through the Grand Canyon, visit other countries,” I said. “But, John, when are you going to finish it? You should call Google Earth ‘Google Dirt.’ What about the ¾ of the planet that is blue?”

This conversation launched an endeavour to extend Google Earth’s mapping features to the ocean. Earle worked with Google’s team to add an “explore the ocean layer” to Google Earth, which was released in 2009. Thus the foundation for Google Ocean is a mapping technology originally developed for visualising land. On top of an otherwise uniformly blue map of the seafloor, Google Ocean gives you a toolbar option of turning on and off specific sets of data.

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18 Helmreich (2011).
19 Keyhole, the company which created the mapping technology, was acquired by Google in 2004 and its flagship product became Google Earth.
21 Even visualizations of the land can be misleading; because Google Earth is composed of many satellite photographs taken over time, any moving objects such as ships or cars are seen dotted across Google’s earth.
called “layers.”

Clicking on the icon for one of these layers brings up a textbox that might include information, photographs, video, or animations on the map itself.

Google Ocean is a good first step towards the goal of making the ocean not a space “outside” society but a lived space “of” society. The types of ecological relation that Google Ocean enables, its flexibility traversing scales from the local to the global, suggest what Ursula Heise calls “eco-cosmopolitanism,” a way of experiencing an immersive connection between self and distant places. However, analysing the visual rhetoric of Google Ocean asks that we go beyond celebrating its technological sublimity. Google Ocean facilitates a particular “distribution of the sensible,” a term I borrow from Jacques Rancière, which describes “the system of self-evident facts of sense perception that simultaneously discloses the existence of something in common and the delimitations that define the respective parts and positions with in it.” In Google Ocean, the map is what the community of viewers has “in common,” positioning each viewer as a satellite able to gaze down onto different parts of the world. This viewpoint has called the “Archimedian standpoint,” “bomb’s eye view,” or “world-target,” denoting a particular position of power, and way of seeing the whole world as if from the perspective of a projectile bomb or orbiting, unearthly satellite.

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22 These groups include ARKive: Endangered Ocean Species, Explore the Oceans, Shipwrecks, Census of Marine Life, Cousteau Ocean World, Marine Protected Areas, Dead Zones, Animal Tracking, National Geographic, and Water Sports.
23 Steinberg (2001).
24 Rancière (2004), 12.
25 See Arendt (1958); Virilio (1977); Chow (2005).
Google Ocean’s “normative point of view”—the scale and location in which the application opens—involves a blank ocean with uniformly blue coloration and land as varyingly yellow, green, white and brown. The ideological dimensions of such visual choices stand out when contrasted with more mischievous maps, such as one that reverses the normative colours—the land is uniformly blue, and the ocean basins textured with yellow, green, white and brown. Colours train us where to look for details, such as changes in elevation, focusing our attention in a way that predetermines what “matters.” The gently textured blueness of the ocean in Google Ocean’s normative view connotes blankness, which is both the prerequisite imaginary for the extension of empire and a socially constructed choice of representation. As Philip Steinberg writes in *The Social Construction of the Ocean*, the ‘blankness’ of the ocean in maps historically

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emerged: “by the early 17th century, maps featuring sea monsters representing marine nature and ships representing social activity that transpired in the arena of ocean-space began to be replaced by maps portraying a grid over an essentially featureless ocean.”27 Both blankness and the iconography of sea monsters and ships are abstractions and specific choices of representation that participate in different constructions of the ocean as a place either open to extensions of empire, or already-populated with a mélange of occupants.

![Figure 17: Screenshot of the “Normative view” of the Google Earth interface.](image.png)

However if we zoom into a sea-level view, we see a variety of detail added in ‘layers’ such as National Geographic, Shipwrecks, Census of Marine Life, Sports, and others. The hypermediacy of the layers—the way they embed a combination of text, images, video, and

27 Steinberg (2001), 107.
animation—functions much like the iconography of pre-17th century maps and their sea monsters. These annotations at sea-level view offer an interactive counter-logic to the normative view of Google Earth (Fig. 17). For example, in the layer “Animal Tracking” (Fig. 18) you can see the route that a tagged marine animal swam (fin whale, humpback whale, great white shark, sea lion) from a satellite perspective, and then click “play” to see an animation of the animal’s route as if from its own perspective. This approximates a kind of “crittercam” point of view through compounded eyes—the viewers’, the animal’s, and the camera’s—although without partial glimpses of the animal’s body you usually get in crittercam footage and without experiencing the opacity or friction of seawater. Instead the animal itself is invisible, signified only by its movements, taking you along an automated path as in Google Streetview. The only traces of the animal are its satellite coordinates at particular moments in time which, depending on their frequency and direction, can lead to either a smooth route (as with the fin whale) or an incredibly dizzying, zig-zag motion (as with the great white shark).

28 Haraway (2005), 250.
29 For these tracks to be meaningful, one would need to combine a study of the animal’s movements along with a clear understanding of the tracking technology itself, of when it was possible to broadcast locational data, in addition to other contexts involving seasons, currents, and the movements of food sources.
Figure 18: Screenshot, “Animal tracking” layer of Google Ocean, featuring the migration data of a great white shark off the coast of California, route shown in white.

The productive tension in scale between global and sea-level in “Animal tracking” involves both machine and animal points of view, where machines enable and constrain the possible subject positions we might occupy in relation to the global map. The point of view is not entirely disembodied, but cybernetic, one that takes place in the machinic Umwelt (a term that Jacob von Uexküll uses to indicate “perceptual worlds”) of satellite technologies. Like an aquarium, Google’s ocean stands apart from the comfortably dry viewer. It is this structure as a discrete container that makes the aquarium so very compatible with the logic of the database. Distinguishing between narrative and database, Katherine Hayles discusses how relational databases require “self-containment” or in technical literature, self-description: “A database is
said to be self-describing because its user does not need to go outside the database to see what it contains.” Strategies of containment make aquariums and databases equally possible.

However shifts in scale do not enable Google Ocean to incorporate elements of seawater’s specific materiality, or what I discussed earlier as the specific principles of chemical change and vitality that challenge the possibility of any stable data. As we zoom into Google’s ocean we meet no resistance, but see and hover clearly as if through perfectly clear air. Yet perhaps it is not even air. As Helmreich observes, Google Ocean does not model gravity; the world is rendered weightless and transparent, with “many watery materialities missing.” In fact, we might say that Google Ocean is aesthetically more terrestrial and than oceanic, specifically through two things: how it renders oceanic space as a kind of Cartesian “container” (its aquarium aesthetic of viewing) and through its terrestrial logic of sedimentation, which we can see in the layer aesthetic. The layers are part of the Cartesian rendering of space, able to turn on or off content in a way that doesn’t affect the base map. The container metaphor of ocean space is apparent through the transparent atmosphere and water (Streetview underwater is clear, although not programmed to see much besides blue).

Because Google Ocean structures viewing relations in aquarium terms—a transparent screen/glass separating observer from observed, framed by a rectangular window—we can say the sensible is not simply distributed from user to globe, but scaled in such a way as to erase the materiality of seawater: its opacity, viscosity, its chemical and vital properties. Google Ocean also forecloses the perception of change over time, offering instead a static snapshot of seemingly immortal waters. One seeming exception where the snapshot indicates a process beyond itself is

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30 Hayles (2012), 177.
31 Helmreich (2011), 1225.
32 Gíslí Pálsson leverages a similar critique against fisheries scientists in “The Birth of the Aquarium: The Political Ecology of Icelandic Fishing” (Pálsson, 1998), where treating the ocean as an aquarium or manageable space brackets out the observer from the thing observed.
the layer called “Dead Zones.” Oceanic “dead zones” are a common name for hypoxia, which indicates decreased amounts of dissolved oxygen in the water. The “Dead Zones” layer uses icons of dead fish to annotate the larger map, indicating that a particular bay, harbor, or area of the sea lack the amount of dissolved oxygen necessary to support sealife. Just as “Animal Tracking” gestures beyond the map through reference to the absence of an animal body, “Dead Zones” uses an icon to indicate the absence of many bodies, over a marked but unbounded space. Although the icon of the dead fish stands in for a process (deoxygenation), the process is not temporally marked with a start date anywhere, figuring as yet another example of how Google Ocean’s layers have not adequately dealt with change over time.

Thinking with seawater in relation to global mapping projects like Google Earth/Ocean is especially poignant when thinking about climate change and the rapid coral bleaching in response to ocean acidification. If the ocean’s features do not change over time in our digital representations/animations of them, then we risk believing in an idealized form of nature that is invulnerable to the actual environmental changes happening at a variety of temporalities, a situation Rob Nixon has compellingly written about in *Slow Violence and the Environmentalism of the Poor*. Slow violence describes the scale of environmental changes such as glacier melt, sea level rise, and toxic chemical leaching that, because of their slow scale, are not easily perceived as violence to people, yet are due to anthropogenic effects interacting with natural processes. A more ecologically and timely instantiation of Google Ocean might find a way to animate the ocean in such a way that scales “slow violence” to human perception.

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3.4 Zooming in: ATLAS in silico

Google Ocean is one of many interactive data visualisations of the ocean that seeks to seamlessly link the real ocean with its digital replica, a cybernetic articulation that appears intensified in new projects such as the remote underwater observatory NEPTUNE. Located off the coast of Canada, NEPTUNE includes collections of sensors that broadcast information about currents, temperature, and other data to scientists on shore. “We’re the world’s first regional-scale underwater observatory network that plugs directly into the Internet. People everywhere can “surf the seafloor,” while ocean scientists run deep-water experiments from labs and universities all around the world.”34 NEPTUNE’s networks represent, “a vision of the sea as a space that can be remotely monitored and managed. Ocean and cyberspace […] woven together.”35 Seeking to expand NEPTUNE into an even bigger project, John Delany has given a recent TED talk entitled “Wiring an Interactive Ocean,” and revealed plans to increase the underwater sensory laboratory and add drones that would carry samples of deep-sea sediment to scientists on land.36

The next data visualization I turn to, ATLAS in silico, does not simply translate the ocean into a digital database, as Google Ocean and NEPTUNE do; it performs the conceptual inverse by considering the ocean as already a natural database of the genetic material of marine microbes.37 This biopolitical figuration considers seawater as a kind of biotechnical soup, first abstracted down to its informatic solute (microbes), and then abstracted again down to only part of the microbes (fragments of protein sequences). One project that illustrates the viewpoint that the ocean is always already a database is the Moorea Biocode Project, which seeks to establish “a

35 Helmreich (2009), 241.
37 Stefan Helmreich rather poetically notes the equation of database and microbial genomic data: “If the sea was once a chaotic and cosmic amnion, an archive of life primeval and life to come, those pasts and futures nowadays read more like a mix-and-match database than a straightforward, stratigraphic archaeological record.” See Helmreich (2009), 99.
library of genetic markers and physical identifiers for every species of plant, animal, and fungi on
the island of Moorea,” an island in French Polynesia.\textsuperscript{38} Referred to in one article as ‘Moorea’s
Ark,’ the endeavor participates in a long tradition of taking the island as an isolated site for both
preservation and experimentation.\textsuperscript{39} In dystopic speculative fiction like Paolo Bacigalupi’s \textit{The
Wind-Up Girl} and Margaret Atwood’s \textit{MaddAddam} trilogy, the genetic database is a treasure that
holds the key to both restoring lost species and making designer organisms.

\textbf{ATLAS in silico} draws on a dataset gathered by J. Craig Venter, who pioneered the
human genome project. Sailing on his personal yacht Sorcerer II, Venter and four other scientists
circumnavigated the globe collecting data (microbes filtered from hundreds of litres of ocean
water) from the mid-latitudes for the purpose of genetically sequencing and cataloguing
microbes.\textsuperscript{40} Though critiqued by marine microbiologists for “random sampling” rather than
developing a set of standards for sampling that specify times, depths, and seasonality, the data
collected by Venter’s expedition has been made available on two databases: the Community
Cyberinfrastructure for Advanced Marine microbial Ecology Research and Analysis (CAMERA),
an online resource for marine metagenomics, and UCSD’s division of the California Institute for
Telecommunications and Informational Technology (Calit2).\textsuperscript{41} A collaborative group of artists

\begin{footnotes}
\footnoteref{38}Moorea Biocode Project: \url{http://mooreabiocode.org/about/biocode-objectives} (accessed June 2012).
\footnoteref{39}See Deloughrey (2013) and “Moorea’s Ark” in \textit{Hana Hou} Vol. 15 (4):
\url{http://www.hanahou.com/pages/Magazine.asp?Action=DrawArticle&ArticleID=1102&MagazineID=69} (accessed
June 2013).
\footnoteref{41}Initially, CAMERA is making available all the metagenomic data being collected by the J. Craig Venter Institute's
\textit{Sorcerer II} Global Ocean Sampling (GOS) expeditions, which have sampled microbial communities around the globe,
plus 130 new full genome maps of ocean microbes. The initial incarnation of CAMERA also includes two other data
sets: a large-scale metagenomic survey of marine viral organisms collected from sites around the North American
continent by Forest Rohwer and his research team at San Diego State University and a vertical profile of marine
microbial communities collected at the Hawaii Ocean Time-Series (HOTS) station ALOHA by Ed DeLong and his
research team at MIT,’ quoted from the J Craig Venter Institute:
\url{http://www.jcvi.org/cms/research/projects/camera/overview/} (accessed August 2013). Also see CAMERA website:
\end{footnotes}
and scientists at UCSD worked with Venter’s data to create the next visualization I discuss, ATLAS in silico.

Whereas Google Ocean scales down the totality of the ocean into an interactive map, ATLAS in silico scales up the very small (protein fragments) up to a human-perceivable size. Visually, ATLAS in silico looks like the deep sea: imagine bright blue freeways of data particles streaming across an inked black background, an immersive environment that creates the feeling of space exploration. These particles each stand for “one data record describing a unique protein sequence from the GOS [global ocean survey] data.” Particles are also referred to as “open-reading frames” (ORFs), the predicted amino acid (protein) sequences of their DNA. Each particle circulates in a broad, three-dimensional flow. These particles, “when brought in to close proximity by participants become luminous three-dimensional objects that reveal their story in multiple layers of information that intertwine biology, with its social, environmental and metadata contexts” such as salinity and the depth at which they were collected. The “life-size rendering” of the genetic information into a symbolic body (“shape grammar”) is adjusted to a scale and size that we can view, interpret, and manipulate for the purpose of detecting patterns in the data.

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43 The reason the sequences are ‘predicted’ is because of Venter’s method of ‘shot-gun’ sequencing that relies on algorithmically assembling millions of DNA fragments into amino acid sequences.
Figure 19. Ruth West, User interacting with ATLAS in silico. Each particle in the stream is a fragment of Global Ocean Survey data, represented by “shape grammar” (middle image) that the user can zoom into, along with information about where the data was collected.

Through both visual and audio feedback (of sounds that relate to viewer position and selected content), ATLAS in silico allows for haptic interactivity, putting abstract microbial genomic data in relation to a human scale. The collaborators write that this data can be played with by a human participant, allowing for “an open-ended auditory data-mining process in hopes of revealing unknown or unpredicted features through the formation of emergent patterns.”

ATLAS in silico not only shifts the scale of the microbes up to human size, but also reciprocally

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45 Großmann et al. (2008).
shifts the human down to the scale of (predicted) protein sequences. This is one of the poetic effects of juxtaposing human and DNA fragment: not only to render intelligible the microscopic, but to speculatively allow the human viewer to imagine herself immersed in the world of microbes.

Figure 20. Ruth West, Examples of the randomly generated “shape grammar” that stand in for unique protein sequences.

It would seem that ATLAS in silico presents an innovative and engaged example of thinking with the materiality of seawater, largely due to its choice of life forms (microbes). Microbes not only have the capacity to not only pass on genes to their progeny, but also to laterally transfer genes to each other on occasion, making them ideal candidates for transcription into an atlas. In Alien Ocean, Helmreich pays attention to the way that marine microbes are
viewed as “living machines” or, here, “living data.” Here, marine microbes are fragmented and articulated in terms of being almost purely information, manipulable by humans with a variety of research agendas concerning the origin, evolution, and replication of life. It would be tempting to say that ATLAS in silico represents a way of thinking through the fluidity of microbial genetic information as it is shared in the ocean, as available and constantly circulating within microbe populations themselves.

However, ATLAS focuses on a very specific materiality: not the materiality of seawater as a whole with its composite chemical and biological properties, but that of microbial genomic material. ATLAS in silico’s microbes have undergone multiple “transductions” or material conversions from seawater, to a ship, to shotgun-sequenced DNA fragments, to information in a database, to shape grammar in the final artwork. Like the view of the whole earth in Google, our access to the microbial genomic data is not direct, but transformed across scales, mediums and technologies of intelligibility. Yet this practice is not only a matter of transduction, but also a matter of erasure of the bodies of the microbes, whose genetic data has been “liquefied” by the process of sequencing, thus artificially creating a new abstract space and place for contemplation and play with information re-embodied in randomly generated shape grammars. ATLAS in silico inverts the bodies of marine microbes, turning their bodies inside-out so that their genomic material may be abstractly represented as the small blue dots circulating in the installation, which can be examined more closely to view patterns in the other data associated with them. This literalizes the idea that seawater contains information, and through its abstractions, it both reveals and conceals the microbe.

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46 Helmreich (2009).
47 Ibid.
What ATLAS in silico does teach is that the scale of data matters for thinking materially with water. Both ATLAS in silico’s abstraction of a microbial gene pool from seawater and its micro scale allow for a conceptual commensurability between ocean and digitality. This poetics works because at the microscopic level, seawater does not demonstrate the same properties as it does on a macroscopic level (encrusting and transfiguring large objects) that we see in The Tempest, or in the sculptural work of Jason de Caires Taylor. With microbial DNA fragments, change is conceived of not as transfiguration, but as rearrangement. These two factors—abstraction and scaling down—are what make the logic of digitality commensurate with seawater’s abstracted materiality. The DNA fragments are still preserved, but they have been scaled down to units of exchange that cannot be transfigured by seawater in the same way large objects can (like Ferdinand’s father in The Tempest); instead, participants can interactively recombine them. If atlases “simultaneously assume the existence of and call into being communities of observers who see the same things in the same ways,” then ATLAS in silicio promotes a specific community of viewers who see microbial life as always already informatic.

Our consideration of ATLAS in silico’s aquatic materiality also depends on whether we consider the DNA fragments as part of the water, or as solute, that is suspended in seawater. What is seawater, what is sediment? In the installation itself, fluid dynamics equations animate the movement of the blue dots, and one could argue that they are more of the precipitate rather than the water itself. It also raises a follow-up question: is information atomistic, akin to a stream of sand, or does it belong to its fluid suspension?

Yet abstraction also allows us to see material connections; if we consider the micro scale, we see that one of the substances linking microbial bodies with the digital technologies is the

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48 Daston and Gallison (2010), 27.
element silicon. Viewed in this way, ATLAS in silico suggests a radical experimentation with the materiality of seawater through its meta-reflection on the substance of silicon, an element widely present in the internal structures of diatoms. In his famous “Gaia hypothesis,” James Lovelock discusses how the sea is dominated by protista such as algae and plankton. Diatoms are a type of algae with skeletal walls made of silica. The skeletons of diatoms are made of opal,

[...] a special gem-like form of silicon dioxide, usually known as silica, the main constituent of sand and quartz. Silicon is one of the most abundant elements in the Earth’s crust; most rocks, from clay to basalt, contain it in combined form. It is not generally considered of importance in biology—there is little silicon in us or in anything we eat—but it is a key element in the life of the sea.

In an ironic (siliconic?) turn of fate, the microbes (reduced to genomic data) are now reincarnated in new silicon avatars: the array of computers and LCD screens. ATLAS in silico is the end of a journey from silicon to silicon.

A crucial difference between the fluidity of microbial genetic information in the wild, so to speak, and in ATLAS in silico is that ATLAS puts the human at the center of the installation. Just like Graham Weinbren’s “swimming user,” the user of ATLAS in silico selects, organizes, and finds patterns within a database. Unlike actual seawater, the data in the database itself does not autonomously recombine and evolve on its own, but constitutes a set of building blocks for future observers to play with. The protean force of seawater is instead frozen in place, and the transfigurative properties of seawater are simply not in play. Although ATLAS in silico uses fluid dynamics equations, this only models a generic fluidity; it does not represent a truly protean aesthetic of engaging the chemical force of seawater.

49 Lovelock (1979). Protists are only one type of ocean microbe. Other ocean microbes include archaea bacteria, fungi, and viruses.
50 Ibid., 94.
I turn to one final example to distinguish between ocean and database, the Artificial life (A-Life) installations *Tierra* and *A-Volve*, that seem to offer a way of thinking of the digital as a kind of seawater. In Thomas Ray’s *Tierra*, computer scientists strive to “evolve” self-replicating algorithms inside computer memory, involving processes of both growth and rearrangement. A-Life takes the computer as a world in which simplistic, virtual creatures may emerge, compete with each other for resources (memory space for replication), and eventually die out according to a separate series of algorithms, or rules of the virtual world. Separate algorithms constitute the virtual “creatures” that are regarded by some people as mere simulation, and by others as an instantiation of real life itself. As Sarah Kember writes, the computer figures as a virtual ocean of life: “The RAM [Random Access Memory] of the virtual computer is referred to as the ‘soup’ in which the machine codes or ‘self-replicating’ algorithms ‘live’ as ‘creatures.’” Helmreich compares the experience of visiting an A-Life conference and moving from one simulation to the next as similar to strolling, “from one tank to another at a sea life museum.” Here the computer functions as a womb-like ocean, a matrix in both reproductive and computational senses of the term. Silicon substitutes for seawater, and it would be tempting to say that code functions as both environment and organism. Yet the environment is precisely what has been elided; inside the computers hosting A-Life, the only “environmental” factors are other organisms, continuing to propagate their internal structure. Rather than the direct kind of environmental shaping we see with seawater, A-Life avoids the question of milieu by focusing primarily on the internal generation of form; the “soup” of code is merely metaphorical.

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51 For a more detailed discussion of *Tierra* see Chapter 9 in Hayles (2009), and Christa Sommerer and Laurent Mignonneau’s ‘Art as a living process’: 
52 Kember (2000), 518.
Google Ocean and ATLAS in silico show that scale matters for thinking materially with seawater in ocean animations. On a macro scale, seawater’s materiality is both a creative and destructive force that sometimes reorganizes, sometimes diffuses, sometimes grows on what it touches, a principle that artists like David Gatten and Jason de Caires Taylor have taken advantage of in their material artwork. Such a principle is missing from Google Ocean: other layers such as Shipwrecks, Census of Marine Life, ARKive, and National Geographic employ a sedimentary logic of accumulation such that you can always return to the objects, marked, at any time of day or after any duration of time—they will still be there. In other words, form does not follow content: while a valuable educational tool that may provoke interest and wonder in the general public, Google shows the ocean at the expense of employing many material properties of the seawater itself. The same disjuncture between form and content occurs on the micro scale of ATLAS in silico, where a mirroring of form and content is made possible through abstractions (for instance, taking microbes out of seawater, and protein fragments out of the microbes). These abstractions enable a picture of an ocean that is compatible with the logic of exchange and digitality. But because such abstractions are always negotiated, explored, arranged and played with by a human user, ATLAS in silico shares more with Weinbren’s database aesthetics than with the creative autonomy of seawater itself.

3.5 Cultivating an Archive

To conclude, I turn to my original question: how might a medium-specific theory of media proceed from the materiality of seawater, such that it considers “data” as forms in an enlivening and transformative milieu? One digital artwork that seems to embody a seawater

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54 For example, see David Gatten’s experimental film piece ‘What the Water Said’, or Jason de Caires Taylor’s underwater sculptures like ‘Vicissitudes’ and ‘Silent Evolution’.
aesthetic is a simulation by the Virtual Human Interaction Laboratory at Stanford University on ocean acidification. Seeking to educate the public about the effects of ocean acidification—where the oceans slowly absorb excess atmospheric carbon dioxide—Jeremy Ballinson and a group of researchers designed a virtual reality simulation that placed the participant in a Mediterranean coral reef:

For the next 13 minutes, you become a pink coral among the dark purple sea urchins, sea bream and sea snails that swarm around you. But by the end of the simulation - which fast-forwards to what the reef will look like at the end of this century - those brilliantly varied and colorful species have disappeared and been replaced by slimy green algae and the silver Salema Porgy fish - a species that will likely thrive in the higher acidity. Eventually, your own coral skeleton disintegrates and you disappear. The rocky reef ecosystem has been destroyed. "If ocean acidification continues, ecosystems like your rocky reef, a world that was once full of biological diversity, will become a world of weeds," the narrator says.

Part of the goal of the simulation is to see “how your personal carbon footprint contributes to ocean acidification,” in this case by asking you to be a coral, and seeing what happens to the reef as acidification intensifies. In this way, Ballinson’s virtual reality simulation seems to embody a protean aesthetic, having viewers experience what it means to immerse themselves in the changing nature of seawater over an accelerated time scale, a speculative future.

Yet upon further scrutiny, the simulation raises conceptual problems concerning the disciplinary, biopolitical aims of the work. Ballinson writes, “we've demonstrated [through other simulations] that either reading about a problem or watching a movie affects peoples' behavior

56 Ibid.
less than having a person actually experience it virtually. More articles about climate change or documentary films - while educational - are unlikely to generate meaningful behavior change on a wide scale.” This is a tall claim, neglecting to specify which documentary or documentaries where shown and deemed unlikely to change behavior. Furthermore, it assumes that documentary films should be judged by their efficacy as a biopolitical tools for behavioral management, rather than as artforms that might provoke reflection without necessarily prescribing behavioral solutions. In contrast, the structure of Ballinson’s ocean acidification simulation is intentionally aimed at shaping the actions of the individual. The narrative functions disciplinarily, couched as an ultimatum: if ocean acidification continues, then a world that was once full of biological diversity will become a world of weeds.

Although the urgency to address such a possible future is real, I think that the audience Ballinson aims for—the individual—is the wrong target. Rather than focusing on the consumer (or level of the individual), such an immersion program would be better aimed at discussing the structural complexity of global carbon consumption. Instead of striving to coerce individuals into changing their habits, the immersion would be better aimed at showing possible points of change or vulnerability that could shift the system; for example, how much of the economy would have to shift to renewable energy for meaningful effect. Nonetheless, Ballinson’s simulation is one of the few digital ocean visualizations that actually incorporate the force of seawater to change things, even as the water is changing at the same time.
It is clearly not enough to create databases or ocean visualizations that employ an aesthetic of change; we should also consider what would constitute meaningful subject positions and interactivity that engage questions of ongoing care. At a recent panel stream I was part of at the Society for Literature, Science, and the Arts (SLSA), one of the presenters—Jaime Skye Bianco—responded to the polluted state of the Salton Sea in a performative talk combined with video footage, where she circulated a small stray of debris. When the tray passed to me, I looked in, noticing that there were many small barnacles. Suddenly I was hit by the rotten, sulfurous odor. Guiltily, I quickly passed the tray on, reflecting that the Salton Sea had really made an unignorable effect that was compelling beyond visuals and sound. During the Q&A I asked about how one accounts for recording smell as part of the experience of documenting the Salton Sea, and Bianco replied by saying that by collecting debris from the site, she considered herself to be “cultivating an archive” with all its living bacteria, rather than simply collecting or assembling...
one. In her case, “cultivate” was not only a metaphor, but literally a process of occasionally misting her objects with water to maintain existing, and odiferous, bacterial colonies. Yet I was struck by the potency of “cultivate” as a way of relating to one’s archive that accounts for the way things might endure but also die, and that there must be effort on the part of the curator to continue the liveliness of the archive. Some records—archives, databases—need maintenance.

Figure 22: Screen-shot of Ruth Wallen’s website for her 1978 work, The Sea As Sculptress, documenting the life forms seasonally growing on planks of wood immersed in the San Francisco Bay. This macro-photograph portrays a nudibranch, common in May, as indicated by the chart at the bottom of the page.

Ruth Wallen’s artwork The Sea as Sculptress (Fig. 22) attests to Bianco’s aesthetic of archival cultivation, bridging seawater and digital materiality. Wallen took her earlier artwork from 1978—the macro-photographic documentation of wooden planks immersed in the San Francisco Bay, and their seasonal changes in life—and resituated these images on a web site. This
involved two acts of remediation: translating the sea’s “sculptures” into photographic slides, from which she gave performative talks, and then more recently “digitizing over a thousand slides and creating an extensive web site as part of the Outdoor Exploratorium.” Wallen’s work gestures towards the way that the ocean functions as co-artist or even co-scientist in the investigation of seasonal changes of ocean life, adhered to objects. Wallen writes, “As opposed to much of the land art of the time, which took the form of monumental earth works, I wanted to work on a small intimate scale” focusing on changes occurring on tiny areas of the wood.

Spanning art and science, Wallen’s work speaks broadly to the way that human communities can work to “cultivate” an archive of life. Defining water quality expansively as “the flourishing of organisms living in estuary waters” rather than “the absence of pollution,” Wallen offers a way of thinking complexly through an aesthetic of seawater and indexicality. First, the presence of certain organism populations (“indicator species” that serve as an index of health) attests to the livability of the bay waters. Second, Wallen’s photographs of these organisms indicate an “indexical” relationship to the life they document. This double signification—of organisms signifying the health of waters, and photographs signifying the presence of the organisms—forms the precondition for the work’s digital instantiation. Rather than erasing traces of mediation, the digital work involves a nesting of “evidence”: the digital points to the photographic, which points to the biological, which points to the overall health of the San Francisco Bay in the late 1970s when Wallen cultivated her work. Even though its final form is not as interactive as ATLAS in silico in terms of bodily relation to data, or as conducive to exploratory navigation as Google Earth, The Sea As Sculptress involves a principle of seasonal and biological change central to any notion of the ocean as database, enfolding multiple processes.

57 Wallen (2009).
of mediation over time. As we continue to design our archives, situated between protean change and digital capture, there is much still to be cultivated.
4. Interface: Fathoming the Interface in Scuba Diving

“Breathing Underwater is an Unnatural Act.”
- Diver’s Alert Network, seminar title

“The oceans are our planet’s lungs.”
- Sylvia Earle, The World is Blue: How Our Fate and the Ocean’s Are One

4.1 Human Being Underwater

There is something surreal and science fictional about the image of a human being breathing underwater. Perhaps it has to do with the sense of being both entirely out of place, existing where one normally should not be able to, and returning to our evolutionary place of origin. This queer sense of displacement, of the body in a between state spatially and ontologically, suffuses a broad cultural imaginary of fictional human-like beings underwater. Take for example the racial hybridity of Marvel’s Aquaman or the character Aspen in the graphic novel series Fathom; or the beautiful androgyne of Ichthyander in the Russian novel and film Amphibian Man; or the transhumans of Peter Watts’ novels Starfish and Maelstrom, with their mechanical lungs. The image of the human being underwater has coincided with a variety of transgressive boundary conditions, blurring categories of species, sexuality, race, and technics—as well as relations between body and environment, which will concern us here.

I now turn to Jacques Cousteau’s autobiographical non-fiction writings in The Silent World as a series of moments through which to rethink the and boundary conditions of the

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“interface” in media theory through the image of the human being breathing underwater.

Cousteau playfully referred to his comrades as “menfish,” or homo aquaticus: not evolved as such, but augmented by the prosthesis of the aqualung to breathe underwater. For Cousteau, the interfacial conditions of diving are not only a matter of the surface of the lungs, but involve the complexity of air tanks, regulator, air, lungs, and bodily absorption of air into the tissues. This volumetric, biochemical, and distributed sense of interface shifts away from the focus on surfaces and control, as theorized in more recent media theory. Since the flurry of writings on new media from the 1990’s to the present, the concept of the “interface” has been predominantly tied to computers and screen culture, surfaces that display interactive visual iconography. Unlike discussions of screen technologies, the interface in diving does not only involve a visual capacity to interpret signs (such as the readings of one’s gauges measuring depth and remaining air), but also somatic and proprioceptive feedback of how one’s ears, sinuses, head, lungs—any air cavity—feels. Bodily discomfort is an important non-visual “sign” that indicates how the diver should proceed. Preliminarily, we might say that the interface in diving is the complexity of body, air, and equipment, a “portable surface” whose injury-free functionality depends on how deep one dives, and how long one stays there.

Drawing on my experience as a scuba diver, I read Cousteau retrospectively as a media theorist, to think through the concept of interface in media theory. Whereas in media theory, the interface has been imagined as a surface that one looks at and touches to exert control over a (distant) object, the “interface” in diving is not just the lungs; it extends into body tissues that become saturated with nitrogen and oxygen, opening the body to risk. SCUBA asks us to think beyond a visual hermeneutics and consider a more of a durational, non-visual, distributed, and non-cognitive interface pneumatically linking self and technology. Thinking of the body as a measure, as self and interfacial control, indexed to the risk of discomfort and pain, changes the
dominant interpretation of the concept of the interface in media theory. Diving asks us to rethink how we understand “technical interfaces” between human beings and world, such that the vulnerability of human beings underwater prefigures other interfacial relations between human beings and oceans. Rethinking “interface” in diving points to the inadequacy of having one overarching concept of “interface” that works for all environments; instead, it proliferates our conceptual vocabulary sensitive to the multiplicity of specific environs and bodies.²

4.2 Theories of the Human-Computer Interface (HCI)

Since the 1980s, the “interface” has been used in a variety of media theory contexts to describe technical forms of relation between human users and symbolic content. Specifically, it is defined and used in relation to mediation, control, and hermeneutics (or reading). Sometimes the interface indicates a concrete physical thing—for example, a computer screen, a control panel, a video game controller, a computer (typically referred to as “human computer interface,” or HCI); other times it is more figuratively imagined as that surface which allows a user to control, to communicate with, or otherwise exert influence over something.³ Either way, interface tends to be constellated within configurations of dry technologies, even for theorists trying to think about

² I have been asked about the difference between experiencing breathing pressurized air in a decompression chamber, and breathing pressurized air underwater. What changes? Is it the pressure that matters, or the immersion in water? According to an article in Alert Diver Magazine, immersion in water does matter. In addition to changes in pressure, it induces thermal stress that results in changes in blood circulation and the urge to urinate: “Many people do not fully appreciate the physiological impact of being immersed in water. An immediate response to the hydrostatic pressure is that a substantial amount of blood normally remaining in the capacitance vessels (veins) of the legs is pushed to the central volume (in the chest). A well-known study of this effect found that an average of 700 mL of blood is pushed to the heart during the resting phase of the cardiac cycle. The heart is stretched by the increased blood volume and responds immediately by contracting harder and then, over a short period, by suppressing certain hormones to promote increased fluid elimination through the kidneys. This is a healthy response to the physiological perception of the presence of excess fluid volume. Practically, this is why people have to urinate even after fairly short periods of immersion.” Matias Nochetto, M.D., in Alert Diver, Summer 2014, http://www.alertdiver.com/AirVsNitrox, accessed 3/2/2015.

different senses of the interface beyond HCI. For example, Joanna Drucker lists, “control panels, dashboards, toaster ovens, home entertainment units, plumbing fixtures, and card catalogs” as examples of typical interfaces, while Alex Galloway writes that his concept “the Interface effect” is “about windows, screens, keyboards, kiosks, channels, sockets, and holes—or rather, about none of these things in particular and all of them simultaneously.” Both theorists argue that the interface is never a matter of a thing or one technology in isolation; however their lists are indicative of our habitual terrestrial bias towards thinking and theorizing technologies, which typically extend as far as computers and their prostheses, technologies that would be ruined by water should it wash over them.\footnote{Drucker (2013), 213.}

In another interpretation, the interface is potentially “everything” semiotically meaningful in one’s environment, raising the question of what isn’t potentially an interface. For example, in “The Interface Theory of Perception,” Donald Hoffman argues that, “our perceptions constitute a species-specific user interface that guides behavior in a niche.”\footnote{Hoffman (2009).} Hoffman draws on the early 20th century Estonian biologist Jacob von Uexküll’s influential writings on animal perception worlds, or Umwelten, to argue that human perception is not of “reality” directly, but of cues in our perceived environment—which of course is a modernized version of Plato’s cave allegory, in which we only ever see shadows of things themselves. Hoffman analogizes this to way that the trash icon on a computer screen is not the computer code itself, but a representation that allows us to interact with it. For Hoffman, perception is a useful fiction that “constructs the properties and

\footnote{However as Jeff Wall has suggested in a short essay, “Photography and Liquid Intelligence,” technology is increasingly forgetting its dependence on water, such as for the production of energy (and to which we might add, as assistance in the air conditioning that cools data centers and other spaces of manufacturing). There is a gaping lacuna in media theory to the extent that it has failed to think through the epistemological issue of the terrestrial bias of thought, or how many of our theorizations operate according to an imaginary that assumes a human observer or philosopher comfortably resting on land breathing air.}
categories of an organism’s perceptual world,” and thus “different species have different interfaces.” Of course, “interface” is also a useful fiction that helps Hoffman understand perception, and it has the effect of focusing Hoffman’s attention on the conscious aspects of perception rather than the non-conscious, distributed ones, which Katherine Hayles and Andy Clarke have discussed at length. One problem with Hoffman’s argument about perception that he leaves out any mention of culture, ideology, gender, race, or psychoanalysis, questions of perception that go beyond biologically determined sensibility. Hoffman’s claim that “natural selection drives true perception to swift extinction […] natural selection rewards fecundity, not factuality, so it shapes interfaces, not telescopes on truth,”9 would be hard pressed to adequately address issues like racial profiling, nationalism, or forms of discrimination and violence based on gender, race, class, or sexuality. Even if we were to agree that human experience is always already a question of interface, to separate the biological from the political in the case of perception operates under a severe naivety in the wake of Marx and Freud.

Joanna Drucker’s writings on the ubiquity of “interface” begin to complicate Hoffman’s through the notion of critically reading interfaces rather than simply interacting with them, introducing the question of hermeneutics. Drucker writes, “we face the challenge of reading interface as an object and of understanding it as a space that constitutes reading as an activity.”10 Drucker’s argument is fairly compatible with Hoffman’s through its emphasis on the recognition of signs in the environment (like Uexküll’s perception marks), not limited to computers or high technology, but inclusive of simpler technologies. Because anything semiotically meaningful can

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7 Ibid. 8-9.
9 Ibid. 21.
10 Drucker (2013), 213.
be an interface, “Interface, increasingly, will be the experience of being in the world.”\textsuperscript{11} Once we recognize this Heideggarian condition, “interface will be construed not as representational but as performative and constitutive, and the need for ways of reading that constituting scrim and its naturalized models of what we take for the world will be ever more urgent.”\textsuperscript{12} However, Drucker’s argument faces the same critical question as Hoffman’s: if everything is a matter of reading interface, what critical purchase or specificity does the term carry? Further, what about interfaces (or “naturalized models” of what we take for world) that aren’t a matter of visual interpretation—is the verb “reading” adequate to speak about them?

Alex Galloway’s \textit{The Interface Effect} (2013) also retains a strong visual dimensionality in his theorization of the interface, even though he moves away from focusing on interfaces as “things” and rather as “effects.” Here, Galloway understands the interface as, “an ‘agitation’ or generative friction between different formats,”\textsuperscript{13} exemplified by the home-screen in World of Warcraft. He reads this screen not as a door or window, but as a “factory floor, an information-age sweatshop.”\textsuperscript{14} The politics of WOW’s interface is not that it connects a virtual world with the player’s world through a window, but that it embeds forms of cooperative labor inside play—a sensitivity to structural forms of power that Hoffman, for one, is not sensitive to. Galloway’s primary examples for reading the interface begin as visual media (painting, WOW), he makes the important point that, “the point of unrepresentability is the point of power. And the point of power today is not in the image. The point of power today resides in networks, computers, algorithms, information, and data”—and these are the \textit{preconditions} for the visual interfaces that

\textsuperscript{11} Ibid., 219.
\textsuperscript{12} Ibid., 219.
\textsuperscript{13} Ibid., 31.
\textsuperscript{14} Ibid., 44.
Drucker and Hoffman primarily focus on. Although Galloway helps us think through a more
distributed notion of interface as a fricative surface or shift in format, this argument only extends
to one level of precondition—the man-made technological—without pushing further to think
about the ecological. The interfacial milieu that he imagines is still a dry one; what happens
when we shift the environmental conditions of the interface to water?

One text that shifts our sense of the interface to water is Branden Hookway’s *Interface: A
Genealogy of Mediation and Control* (2014). Here, Hookway uses the material and mathematical
properties of fluids to theorize the interface as not a thing, but as a modulated effect. Although the
project began as an analysis of the airplane cockpit as an interface, Hookway moved towards a
more general theory of the interface based on the original definition of interface coined by
Engineer James Thompson in 1869:

> [It is] as if the fluid everywhere possesses an expansive tendency, so that pressure must
everywhere be received by the fluid on one side of a dividing surface (or as I call it
*interface*) from the fluid, or solid, on the one side, to prevent the fluid from expanding
indefinitely, or to balance its expansive force. Here, Hookway argues that “*interface* and *fluid*
meet in mutual self-definition,” tracing the

etymology of the term “interface” back to chemistry and thermodynamics. This usefully dates
the word “interface” back thirteen years before Matthew Fuller and Florian Cramer’s article on
“Interface” in *Software Studies*, which only points to the Merriam Webster definition from 1893,

15 Ibid., 92.
16 I would argue that substances like *water* that serves as the precondition for data to be stored today, or the precious
metals that build computer technologies. For example, as Nicole Starosielski has pointed out, water has a major role in
the cooling of data centers and power plants, making water a structural condition for operation of power through
networks and information. A more nuanced version of Galloway’s argument would involve thinking through the
interface and power at this second level, the ecological, or *media ecological*, considering how water and rare earth
metals figure as *technologies* complicit in the material and structural preconditions for power.
17 Hookway cites James Thompson, *Collected Papers in Physics and Engineering* (1912), 327.
18 Hookway (2014), 59.
denoting “‘a surface forming a common boundary of two bodies, spaces, phases.’” Hookway takes Thompson’s fluid definition of the interface as a kind of “primal scene” for understanding contemporary technology:

[… ] it is perhaps fitting to take as an originary definition of interface an inversion of that definition, where the interface is in turn defined with reference to the fluid. Such a definition might read: An interface is a boundary condition that both separates and holds contiguous as one body those parts whose mutual activity, exerted from each part onto the other, is directed into and channeled across that boundary condition; in the case where this body is a fluid, the activity of its constituent parts is expressed as a pressure originating from the parts separated by this boundary condition, and which is exerted perpendicularly to the boundary condition.20

Although Hookway writes many iterations of this definition, he most strongly emphasizes that defining interface in terms of the fluid means that we have to consider that the interface (1) describes the internal processes by which a system is defined (2) marks the difference between a system and the environment within which it operates and (3) constitutes a “site where a dynamic process of forming may become visible, legible, knowable, measurable, and available for capture in the production of work.”21 In other words, the interface is the site of a relationship between two bodies in motion that “maintains, polices, and draws on the separation that renders these entities as distinct, at the same time as it selectively allows a transmission or communication of force or other information from one entity to another.”22

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19 Fuller and Cramer (2008), 149-153.  
21 Ibid., 63.  
22 Ibid., 4.
While this is poetically interesting—that the maintenance of an interface depends on an initial difference between two substances, and that interfaces produce fluidity—it also focuses on only one material quality of fluids: to produce separation and internal difference. Hookway’s generic notion of fluid/fluidity neglects the meaningful differences between seawater, freshwater, air, specific gasses, and plasmas, both in terms of chemical properties and the material imagination of these substances. As Astrida Neimanis, Stefan Helmreich and others have argued, the material specificity of types of fluids matters (for example, saltwater versus freshwater), as well as their multiple properties. Neimanis proposes that, “hydro-logics can be described in a schematised way: gestation, dissolution, communication, differentiation, archive, unknowability. Such a schematisation helps us grasp the multivalent ways in which watery bodies are more than just ‘fluid.’” As we will see, compressed air—a specific kind of fluid—opens our discussion of the interface beyond a general fluidity of separation and “internal” differentiation, towards a materiality that can also permeate fleshy boundaries.

Despite its promising engagement with fluidity, there are further problems in Hookway’s formulation: (1) the way he alternately ascribes and effaces agency to/from interfaces, and (2) how he takes fluidity as a poetics without considering what other kind of work the language of fluidity may be doing. First, Hookway’s writing alternates between defining and describing the interface. Sometimes he takes the interface as active agent (ex: “To produce equilibrium, the interface seeks out differential conditions where bodies come into contact,” my emphasis) and

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23 Ibid., 59. The interface would “define and separate areas of unequal energy distribution within a fluid in motion, whether this difference is given in terms of velocity, viscosity, directionality of flow, kinetic form, pressure, density, temperature, or any combination of these. From difference the interface would produce fluidity” (my emphasis).

24 As I argued in chapter 3, “fluidity” in digital media is commonly modeled on a generic, unspecific sense of the ocean, not its chemical materiality. See also Helmreich (2012) for a case for why the differences in thinking materially with seawater compared with freshwater.


26 Ibid. 64.
sometimes he positions it as an effect ("Within a dynamic form, the interface is not a form so much as a tendency toward a forming," my emphasis). In the first example, the interface seems to be an entity unto itself, having desires that it “seeks out.” In the second example, it appears to be much more amorphous and unidentifiable, defined as a “tendency” and not even really a unitary thing. In other words, Hookway personifies the interface at the same time that he effaces it as a “thing.” Another overall problem with Hookway’s discussion of fluidity is that he barely quotes any female scholars, which is surprising given the long cultural and intellectual history involving women and water. At bare minimum, Luce Irigaray and Katherine Hayles deserve a mention, since Irigaray extensively worked with fluid mechanics to think through feminism and Hayles has written extensively on the history of both cybernetics and chaos theory that Hookway discusses at length.

My second point of critique concerns Hookway’s overreliance on etymology as a referent for meaning, which prevents him from critically engaging with the language of fluidity. For example, rather than arguing that there is an inherent fluidity in the concept of interface, he might have asked, what kind of work does the language of fluidity do? What assumptions does it naturalize? What got lost along the way when “interface” is used to describe human-computer interactions instead of fluidity? Watery metaphors are not always benign or positive; sometimes they function to naturalize and obscure the constructed nature of certain processes. For example, Janine MacLeod critiques the use of language of “flow” and “fluidity” in economics as that which makes Capitalism seem natural, inevitable: “Late capitalist modes of production and consumption alienate the living from the dead and from the unborn, even as they exhaust and contaminate aquifers and rivers. The ‘flows of capital’ metaphor contributes to the aura of naturalness

27 Ibid. 64.
surrounding such conditions.” When we find something theorized in terms of water, we should question to what extent the use of water is used to naturalize facets of that thing or concept. The larger consequence of Hookway’s move to tie interface to generic fluidity is that it naturalizes the relationship between interface and control. In other words, by going to the etymological roots of the interface in fluidity, Hookway implies that interfaces have always already been about control in the mutual forming of a common boundary—a thesis that I will challenge when we turn to Cousteau, where the interface is not only about control but a site of bodily openness and risk. Even though Hookway offers a theory of interfaciality based on fluids, it only relates to the specific case of two fluids forming a common boundary, not the other qualities of fluids that serve to interpenetrate, saturate, wash, warp, and otherwise make a mess of boundary conditions. Despite these problems, Hookway’s conceptualization of the interface is a good beginning: if we consider interfaces in terms of fluidity, they appear as areas of continuous adjustment, the emergent results of interactions between substances and bodies, mutually constituted thresholds of difference.

It is time to think ecologically and milieu-specifically about interfaces. When we do so, it becomes clear that “one” theory of interface is inadequate to the materially, even elementally specific context for thinking relations between humans and technology broadly and in its systemic effects. In tracing the concept of the interface in media theory through dry and wet contexts, I hope to have shown that what many of the discussions of interface have in common is the centrality of vision for how exchange takes place through an interface, as well as the

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29 See MacLeod, “Water and the Material Imagination: Reading the Sea of Memory against Flows of Capital” in Thinking With Water (2013), p. 43: “The displacement of actual waters by the ‘waters of capital’ in dominant cultural imaginaries can be understood as one manifestation of contemporary processes of reification. Reification here refers to the process by which a quasi-abstraction like capital comes to seem as real as a river. The term also describes a displacement from context, in which the origins of a thing, its production by labour and by ecological processes, get forgotten.”
following patterns: the interface can be construed of too generally; it is often characterized as a matter of control extended between humans and technologies through visual cues; and it can either identify a technology, or the emergent relation between a human user and a technology. One consequence of thinking *milieu-specifically*—instead of in terms of a general, mathematical fluidity—is that it asks us to question how a particular interface emerges spatially. As we will see, the instance of human beings diving underwater suggests an interface not as simply an emergent surface, but as a distributed volume of modulated, durational control. Once the interface involves a *subject* instead of only abstract fluids, we see that the interface is not just a matter of substance, but a matter of sustaining life, involving elements of duration, precarity, and a real sense of risk.

I now turn to the autobiographical non-fiction writings of Jacques Cousteau and Sylvia Earle to address these two points about the interface in SCUBA diving and how it asks us consider “interface” in medium-specific ways—ways specific not only to seawater but to the human body *displaced* in seawater—concerning the physiological factor of “saturation” of the body with breathed air, which asks us to think about interfaces indexed to time. Rethinking the interface in diving means considering the fluidity of gases and liquids together, the absorption of pressurized air into the body’s tissues as the diver descends deep underwater, and the saturation of breathed air in the body, a condition that puts limits on how quickly the diver can ascend to the surface.  

Here, interior and exterior are folded into the flesh of the human body through the semi-permeable membranes of the lungs. This interpenetration between body and world, between flesh and air, is the very condition that *enables survival* underwater.

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30 As I explain later in relation to Cousteau, divers often need to make a 3-5 minute “safety stop” at 15 feet below, breathing evenly, which allows the body to exhale the excess gas absorbed when breathing pressurized air at depth. The basic idea is that this stop is like “slowly opening a soda can,” where the blood is the soda with compressed gas in the “can” of the body.
4.3 Cousteau’s Physiology of the Interface

Jacques Cousteau is, arguably, the most influential and recognizable figure of ocean exploration in the 20th century. In addition to co-inventing the aqualung in 1942 with Emilé Gagnan, Cousteau produced a variety of films and TV specials that showed the public what it was like to swim at 60+ feet underwater—in color. Although Cousteau’s first film, *Le Monde du Silence* (1956), contained the now controversial footage of hunting a Grey Whale and dynamiting a coral reef to more easily hunt fish, he later turned into a vociferous advocate for ocean conservation and marine protection. His legacy continues through a variety of media, most recently by his grandson Philippe Cousteau, who broke Jacques’ record of spending 30 days straight underwater in the habitat *Atlantis* in July 2014. Despite family politics, comically exaggerated in Wes Anderson’s film *The Life Aquatic with Steve Zissou* (2004), it would be an
understatement to say that Jacques Cousteau’s legacy still exerts a tremendous influence on ocean environmentalism in the media.

Cousteau’s diving narratives in his autobiographical text *The Silent World*, co-written with his diving friend Frederick Dumas, provide a rich meditation on technology and the human body. I move through several examples from Cousteau’s autobiographical *The Silent World* to think basic differences between how the interface has been theorized in media studies and how it may be construed from the perspective of human physiology underwater. In diving, the “interface” becomes a matter of tactility and proprioception rather than of visual hermeneutics; not about the conscious reading of signs, but a product of non-conscious, automatically delivered air absorbed into the human body. The interface ceases to be a “face” but rather a volume when we consider how the saturation of dissolved gasses in the body indexes the interface to time.

*The Silent World* includes many episodes where Cousteau and his friends (Dumas, Taillez) are hunting fish, breaking depth diving records, and going to the edge of—and in some cases beyond—the thresholds of safety. Becoming “menfish,” the name Cousteau gives to the cyborgian hybridity of the human plus aqualung, was a process highly tied into gendered practices of exploration and risk-taking.31 Venturing under the sea, for humans, requires a kind of “passport” of air that human beings need in order to survive in Neptune’s kingdom, a word evoking both the territorial and physiological sense of permission in crossing a border. From the invention of the diving bell in 1535 by Guglielmo de Lorena of Italy to the diving engine in 1715 by Jonathan Lethbridge of England, the challenge has always been, how to take an air supply underwater?32 While living in Nazi occupied southern France in 1942, Cousteau had asked his

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31 Exploring the sea was a masculine activity; Cousteau writes that his wife could dive but did not have the same “passion” for it, although I would guess that this could very well be related lack of adequate wetsuits to keep warm.
32 Scuba diving emerges in relation to specific economic, political, and military contexts; the first technologies designed to take humans underwater were not for exploration, but for salvaging sunken ships, and have subsequently
friend Émile Gagnan, an expert on industrial-gas equipment, for help designing a device that would be independent of connection to the surface via tubes: “We were dreaming about a self-contained compressed-air lung. Instead of Le Prieru’s hand valve, I wanted an automatic device that would release the air to the diver without his thinking about it, something like the demand system used in the oxygen masks of high-altitude fliers.”³³ Whereas the hand valve required the diver to physically adjust the pressure of air delivered for breathing, Cousteau wanted an apparatus that would automatically deliver air at the ambient atmospheric pressure, where the diver would not have to calculate or think about the correct pressure.³⁴

This “automaticity” of air delivery, over conscious control, is one of the hallmarks of SCUBA technology. Cousteau described it in the following way:

The aqualung automatically fed me increased compressed air to meet the new pressure layer. Through the fragile human lung linings this counter-pressure was being transmitted to the blood stream and instantly spread throughout the incompressible body. My brain received no subjective news of the pressure. I was at ease, except for the pain in the middle ear and sinus cavities. I swallowed as one does in a landing airplane to open my Eustachian tubes and healed the pain.³⁵

Already we see not only a distributed sense of the interface across technological apparati and human physiology, but one that differs from mainstream interface theorizations in that it operates

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³³ Cousteau (1953), 12.
³⁴ Gagnan suggested using a demand valve that had previously been used to feed cooking gas automatically into the motors of automobiles. Using two demand valves—one to modulate the pressure of air from 150 atm to 6 atm in the valve, and then a second to change the 6 atm to ambient pressure—Gagnan designed the prototype of the “aqualung,” or what was to become modern SCUBA (Self-Contained Underwater Breathing Apparatus).
³⁵ Cousteau (1953), 3.
in a primarily non-visual, and non-conscious manner. For example, Cousteau writes that “my brain received no subjective news of the pressure,” and the air is delivered automatically. Even more telling, Cousteau later writes that, “We were acquiring an extra sense of the sea, a sort of autodiagnosis of depth. We meditated on our feelings, trying not to imagine symptoms that were not there.”36 Albeit translated from French to English, it is interesting to note Cousteau’s word choice of “autodiagnosis” over what Galloway and Drucker call “hermeneutics.” Diving does not entail the reading or interpreting an interface in its visual signs and symbols; diving involves feeling the right balance of pressure between world and the interior of the self (blood, lungs, ears).

Upon successfully testing the aqualung, Cousteau reflected, “From this day forward we would swim across miles of country no man had known, free and level, with our flesh feeling what the fish scales know” (my emphasis).37 Cousteau’s formulation of a sensuous epistemics—flesh feeling what the fish scales know—places emphasis not on visual/conscious knowledge, but on the body as a precondition for knowledge in relation to the tactile reciprocity of the ocean environment. Spatial theorist Henri Lefebvre once put it this way, considering how spiders produce space in spinning webs: “the most basic places and spatial indicators are first of all qualified by that [living] body […] long before the analysing, separating intellect, long before formal knowledge, there was an intelligence of the body.”38 In diving, we might say that this “intelligence of the body” is not about the visual interpretation of signs, as we have seen in other theories of the interface, but rather about the body’s proprioceptive knowledge of its internal condition and how this affects movement. Like the athletic ability of gymnasts to orient themselves in space, the practice of establishing “neutral buoyancy” in diving (neither sinking nor

36 Ibid., 19.
37 Ibid., 3.
rushing) depends on an intelligence of the body, not just of the mind; it is also a management of the body’s interface with the breathed air, weight of the gear, buoyancy control device (BCD, or inflatable vest), and lung capacity/breathing rhythm.

Cousteau’s sensuous epistemics evokes Merleau-Ponty’s concept of “the flesh” and his formulation of the body as “measurant,” as a way of thinking through the processes of knowledge and understanding. Merleau-Ponty asks, “Is my body a thing, is it an idea? It is neither, being the measurant of the things. We will therefore have to recognize an ideality that is not alien to the flesh, that gives its axes, its depth, its dimensions” (my emphasis). The body in diving modulates according to air supply and pressure and depth, neither material alone nor idea alone, but relational with the ocean, diving technologies, breathed air supply, and passage of time. I like Merleau-Ponty’s phrase “ideality that is not alien to the flesh,” because one’s body is something implicated in its situatedness, milieu. The submerged body of the human observer is a “measurant” of the depths, sensitized to the milieu-specific conditions of the distributed interface of air, rebreather, lungs, body.

I propose “saturation” as a critical term for thinking about the watery materiality of the human body, changing our sense of the interface as a single surface. In diving, the human body is its own measure of how long is safe to remain underwater. Reading Cousteau revises contemporary media theory’s discussions of the interface through the concept of “saturation,” where the experience of the interface depends on how long the diver has spent underwater and how deep he or she has gone. Cousteau gestures towards the physiological effects of breathing pressurized air, specifically the way that the diver’s bloodstream takes up the pressurized air breathed:

39 Cousteau (1953), 152.
When the diver rises into lesser pressure, the nitrogen comes out of compression and becomes froth, on the same principle as opening a bottle of champagne. The CO2 in champagne, which has been under pressure by the cork, expands theatrically when liberated. So does the nitrogen of the diver’s body when he passes into the lighter water pressure. In mild cases the froth gives him pains in the joints. In severe cases the nitrogen bubbles can clog the veins, cut off the spinal ganglia or cause instant death by heart embolism.  

In this rather typically French example (“opening a bottle of champagne”), Cousteau teaches that the longer the diver is underwater and the greater the depth, the more gas the diver absorbs into her bloodstream. If the diver rises out of the water too quickly without a safety stop, she risks getting “the bends,” as free divers sometimes do. Tissue saturation—as a concept—defines the experience of the interface in diving, determining divers’ behavior in terms of entering and leaving the water. The duration of the dive determines the feasibility of safely leaving the water; one must have a “passport”—indexed to place and time—to not only enter the water (diving apparatus and portable oxygen) but also one to leave the water (exhaling long enough at a shallow depth).

Instances of the failure of the interface in diving, such as with Cousteau’s experiments with breathing different gas mixtures, reveal another aspect of the interface in diving that differs from the conventions of media theory to mainly think of the interface in terms of space but not time, and that aspect is duration. Cousteau’s early diving experiments involved uncertainty about what constituted human physiological limits—or what we might call the nature of the durational  

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40 Ibid., 20.
41 In contemporary diving courses the metaphor of the “soda can” is used to illustrate the parallels between rising slowly and slowly opening a soda can, or rising quickly and having the soda can froth over. In cases of either prolonged diving and/or deep diving, one must do a “safety stop” for 3-5 minutes at 15 feet below in order to allow the extra gas to exit (precipitate out of) the body.
interface between human body and breathed gas. For example, before trying compressed air, a mixture of nitrogen and oxygen, Cousteau experimented with breathing pure oxygen, a highly dangerous practice because it causes poisoning when breathed at high concentrations:

I dived to the boundary of oxygen. I went down with ceremonious illusion. I was accepted in the sea jungle and would pay it the compliment of putting aside my anthropoid ways, clamp my legs together and swim down with the spinal undulations of a porpoise […] I borrowed the characteristics of a fish, notwithstanding certain impediments such as my anatomy and a ten-pound lead pipe twisted around my belt […] Then my lips began to tremble uncontrollably. My eyelids fluttered. My spine bent backward like a bow. With a violent gesture I tore off the belt weight and lost consciousness. The sailors saw my body reach the surface and quickly hauled me into the boat. I had pains in neck and muscles for weeks.42

In “putting aside my anthropoid ways” and borrowing “the characteristics of a fish,” Cousteau adopts a more amphibious posture of movement to swim effectively, but at the expense of his physiological attunement to the surface. However, this experience of free movement is curtailed by the sudden trembling of his lips and loss of consciousness, indicative of oxygen poisoning. In this case, the distributed interface comprised of human-compressed air-scuba apparatus might be described not generically as an “effect,” that we see theorized in Galloway and Hookway, but conditional upon time spent underwater, and at specific depths traveled. It’s also completely non-visual in terms of feedback and cognition; Cousteau only knew that he had reached it when he experienced pain and nervous system dysfunction. Rather than a visual hermeneutics of “reading,” diving asks that we think about interface palpability—of feeling how the body

42 Cousteau (1953), 10-11.
responds to the technologies of air that enable and support underwater immersion, a duration, a sensuous epistemics indexed to time.

Scuba diving’s non-visual interface has inspired new media artworks like Char Davies’ acclaimed VR artwork, *Osmose* (1994), which I will briefly mention here. Liking movement to the user’s breathing, *Osmose* invents a way to move through virtual environments (“natural” spaces of forests and the deep sea, for example). By linking movement to the user’s rate of breathing, the interface in *Osmose* makes the “immersant” (participant) more aware of their body, departing from the ocularcentrism of VR that has continued from the 1990s into 21st century. Mark Hansen suggests that this catalyzes a shift from “a predominately visual sensory interface to a predominately bodily or affective interface.”43 Such an experience constitutes “a non-representational and nonvisual affective and proprioceptive experience of the body” that concretely illustrates “how the living body exceeds the boundaries of the skin and encompasses parts of the environment.”44 Hansen argues that, “the use of immersive virtual reality technology allows her [Davies] to catalyze a performative experience of the indifferentiation between bodily interiority and spatial exteriority” or a blurring of boundaries between self and world through the haptic interrelation of vision and touch.”45 In a different interpretation of *Osmose*, Frances Dyson counters that instead of dissolving the essential mediation between body and technology, *Osmose* only simulates this blurring between self and world, using digital technology to efface its own mediations.46 In other words, *Osmose* presents the illusion of blurring body and technology while allowing them, on a material level, to remain distinct.

43 Hansen (2006), 123.
44 Ibid., 112.
45 Ibid., 136-137.
46 Dyson suggests reading Davies’ work through aurality, “to look at breath and balance from the perspective of listening. The inner ear is after all the seat of balance, while the breath incorporates and is incorporated by that most affective, most troubling bodily production—the voice,” Dyson (2009), 129.
Whether one agrees with Hansen or Dyson depends on whether one views technical extension as mainly affective (as when one is moved by a digital simulation), or whether it needs to be material (as in gas exchange in diving). Yet I would like to contrast the interface in *Osmose* with the interface in diving through the conditions of risk and pain. Mainly: *Osmose* does not risk the body in the same ways that diving practice does. The special cases of oxygen poisoning and the bends—which we could say are moments when the diver falls *out of immersion* or a sense of one-ness with the ocean environment—are painful and harmful transgressions of the physiological limits of human descent underwater. These conditions of real risk and pain, and of the saturation of the diver’s body with pressurized air, signal how different the “interface” in

Figure 24: Char Davies, Virtual environment of *Osmose*, 1994.
SCUBA diving is indexed to a very specific kind of bodily feedback not to the safety of breathing on land. Pain and discomfort give important non-visual cues that alert the diver to potential danger—for example, sinus pain during descent indicates that the diver should “clear” (pinch their nose while breathing out) to equalize the pressure in their air cavities. Such signals show that the volumetric interface that the diver experiences as self is perhaps out of balance, or at the point of causing intoxication or harm. The irony is that Osmose—and digital simulations in general—edits out the osmosis that real diving is predicated on, the breathing of pressurized air and its absorption by the body’s tissues. The breathed interface in diving suggests a volumetric, distributed, somatic, and durational sense of the interface, dependent on the depth that one ventured—rather than as flat, visual, and a fixed sign-system of interaction.

The example of nitrogen narcosis and the hallucinatory effects of deep diving further challenge conventional understandings of the interface as a matter of “reading,” and instead suggest that diving the interface underwater is a matter of illegibility, unwritability, ineffability—an experience only recallable in reflection, not at the moment of narcosis. Physiologically, nitrogen narcosis is, “an effect on the brain of gaseous nitrogen that occurs to divers who go below 100 FSW [feet of salt water], due to the laws of partial pressures.” Cold, stress, fatigue, and CO2 retention can increase the effects of nitrogen narcosis as well. Cousteau writes that the first stage of nitrogen narcosis is like, “a mild anesthesia, after which the diver becomes a god.” Like other forms of consciousness-altering drugs, nitrogen narcosis affects people differently. Cousteau writes, “I am personally quite receptive to nitrogen rapture. I like it and fear

47 Osmosis is the term from chemistry denoting how molecules move across a semi-permeable membrane to move from a more concentrated solution to a less concentrated one.
49 Cousteau (1953), 22.
it like doom. It destroys the instinct of life.\textsuperscript{50} In later episodes in \textit{The Silent World}, Cousteau writes of how his friend and diving partner Frederick Dumas (nicknamed “Didi”) succumbed to it first and began acting “drunk,” and Cousteau had to help pull him to the surface. Such a differential is not unusual: “Tough individuals are not overcome as soon as neurasthenic persons like me, but they have difficulty extricating themselves. Intellectuals get drunk early and suffer more acute attacks on all the senses, which demand hard fighting to overcome. When they have beaten the foe, they recover quickly.”\textsuperscript{51} Traveling up to a lesser depth immediately relieves the effects of nitrogen narcosis.

Let us return to Cousteau’s recollection of diving, following a carefully marked descent line with depth markers, to a record 270 feet.

At two hundred feet I tasted the metallic flavor of compressed nitrogen and was instantaneously and severely struck with rapture. I closed my hand on the rope and stopped. My mind was jammed with conceited thoughts and antic joy. I struggled to fix my brain on reality, to attempt to name the color of the sea about me. A contest took place between navy blue, aquamarine and Prussian blue. The debate would not resolve. The sole fact I could grasp was that there was no roof and no floor in the blue room. The distant purr of the Diesel [engine] invaded my mind—it swelled to a giant beat, the rhythm of the world’s heart. I took the pencil and wrote on a board, “Nitrogen has a dirty taste.”\textsuperscript{52}

Cousteau (along with several other divers) conducted to test the physiological limits of the human body breathing pressurized air through SCUBA technology (or as he first called it, the

\textsuperscript{50} Ibid., 23.
\textsuperscript{51} Ibid., 23.
\textsuperscript{52} Ibid., 88.
“aqualung”). He carried 10 pounds of scrap iron to counter his buoyancy and descend; when he experienced discomfort he stopped, dropped the weight, and held onto a rope line. Boards were attached the line every 5 meters so that he and other divers could write a sentence describing their sensations. However, at that depth these sensations were influenced by the experience of nitrogen narcosis or “rapture of the deep,” a physiological phenomena caused by breathing pressurized air (a mix of oxygen and nitrogen) at depths of > 90 feet, a feeling likened to being drunk underwater. At this point, Cousteau decided to descend further down to the end of the rope:

I could not write what it felt like fifty fathoms [actually less, about 270 ft] down […] I rose through the twilight zone at high speed, and saw the surface pattern in a blaze of platinum bubbles and dancing prisms. It was impossible not to think of flying to heaven.

However, before heaven there was purgatory. I waited twenty feet down for five minutes of stage decompression, then hurried to ten feet where I spent ten shivering minutes.

When they hauled in the shotline I found that some imposter had written my name on the last board.

They all had headaches after; “none of us wrote a legible word on the deep board.” Breathing pressurized air meant that more nitrogen was dissolved in his bloodstream, causing this euphoric effect to the point where all he could write was, “Nitrogen has a dirty taste.” As the text indicates, Cousteau was later able to recall many more details in writing (the words he imagined for the color of the water, the purr of the diesel engine above, the unbounded spatiality of the “blue room”), as well as the inability to recall what he was feeling while in rapture on the given tablets.

This suggests a disjuncture between the ability to speak, write, and describe in the moment of

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53 SCUBA stands for Self Contained Underwater Breathing Apparatus.
54 The colloquial way of referring to the experience of nitrogen narcosis among divers is being “narked.” Contemporary diving courses caution students that narcosis can occur at depths of 90 feet or lower.
55 Cousteau (1953), 89.
56 Ibid., 89.
narcosis and the flurry of detail Cousteau recalled later upon reflection. In diving, the interface is not only durational (according to time spent underwater) but also spatial (its physiological effects dependent on how deep one has dove).

Cousteau’s inability to “write” while experiencing nitrogen narcosis dovetails nicely with the concept of “excommunication,” a term that Galloway, Eugene Thacker, and MacKenzie Wark use to think about the conditions of possibility for communication. “We contend that excommunication was always part and parcel of any communication theory, non-media always lurk at the threshold of media.”\(^5^7\) Thinking about excommunication in Cousteau’s context might refer to both the physiological exclusion (read: excommunication) from the land in diving and to the “non-media” (the ineffable) that were necessary precursors of Cousteau’s delayed writing. Here, “non-media” would include the entire environmental/somatic situation of diving—the intoxicated human body, the pressure of the water overhead, the floorless, roofless spatiality of the “blue room,” the aqualung. In the context of diving, excommunication is that concept which propels us to think about the non-media (or rather, pre-medial, pre-inscriptive) elements of the environment that are the silent, shadowy conditions of possibility for communication to take place.

When at play, and not pushing the boundaries of dive limitations, Cousteau wrote that, “one realized the privilege of crossing the barrier, that molecular tissue which is actually a wall between elements. If it was difficult for men to break through the wall, it was more difficult for fish, which told us with their brief awkward leaps into the air how alien were air and water.”\(^5^8\) Here, that “molecular tissue” is of course the human lung, which facilitates gas exchange between breathed air and the bloodstream. Cousteau’s goal was to “find the limitations of the lung,” a

\(^{57}\) Galloway, Thacker, and Wark (2014), 11.
\(^{58}\) Cousteau (1953), 137.
statement that ambiguously refers to both the human lung and the technology of the aqua-lung. The concept of the “lung” is thus quite expansive—a bio-technical interface that involves continuous modulation between semi-permeable human tissue, breathed gas, and diving apparatus.

My claim, then, is that the interface in scuba diving is a mobile threshold of diffused effects that correlates with a set of variables: depth, breathed gas mixture, and individual physiology, a function of depth and duration. Such conditions show that in diving, the interface is primarily (1) non-visual, and instead somatically felt in its effects (2) a matter of duration, such that the interface changes depending how long one has been underwater and how deep (3) volumetric rather than surficial, since the whole body saturated with dissolved nitrogen/oxygen forms the interfacial area. I now turn to the Sylvia Earle’s autobiographical writings in Sea Change: A Message From the Oceans to consider the significance of bringing human bodies into conversation with the concept of the interface in diving.

4.4 Passport and Trespass: Sylvia Earle’s Sea-Change

Sylvia Earle—the former head of NOAA (National Ocean and Atmospheric Association) and a major ocean environmental activist holding the title “National Geographic Explorer in Residence”—is a fitting complement and contrast to thinking the interface through Cousteau’s writings. Nicknamed “her deepness,” she has published two popular non-fiction and semi-autobiographical books, Sea Change: A Message from the Oceans (1995) and The World is Blue: How Our Fate and the Ocean’s are One (2009), both of which argue for why humanity’s survival depends on the ocean’s health, a kind of ethics that emerges out of her SCUBA diving practice. I

59 Ibid., 18-19.
bring Earle into conversation with Cousteau to touch on two themes—how her writings ask us to think about the expectations of “normative bodies” in diving in relation to gender and size, and to consider the critical concept of “saturation” in her account of living underwater for two weeks through the Tektite II project.60

![Members of the all-women team of Tektite II enter the water (1970).]

One of the most obvious things we notice when reading Earle’s writings after Cousteau’s is the role of gender—or how diving and underwater exploration with its frontier dangers has been largely male-dominated in the West. Earle brings up the counter example of divers in Japan and Korea: “mostly women, known as ama—have honed breath-hold diving techniques to

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60 Earle and the other female scientists were not the only participants in the Tektite II project. It provided the opportunity for 53 diver-scientists to experience living and researching in an underwater habitat, and involved around 500 people in total. See J.W. Miller et al. (1971).
perfection, passing traditions from mother to daughter through generations. "\[62\] Although mentored by the renowned scientist and 1950’s TV personality Eugenie Clark, the “shark lady,” Earle recounts trying to avoid “hassles” through hard work, humor, and not trying to be one of the boys—“even though a price is extracted in terms of bruised self-confidence, stomped-on tendencies towards leadership, and exclusion from being ‘one of the boys.’”\[63\] Earle’s sense of humor also emerges through her recounting various news articles that came out alongside her diving feats—for example:

**BEACON HILL HOUSEWIFE TO LEAD TEAM OF FEMALE AQUANAUTS**\[64\]

**ALL GIRL TEAM TESTS HABITAT**\[65\]

**BRAVE MOM’S HISTORIC DIVE TO BOTTOM OF THE WORLD**\[66\]

The first two titles refer to Earle’s participation in the Tektite project (1970), a two-week residency in an underwater habitat, and the third title to Earle’s record-setting deep dive in a special water-proof suit. What these article titles have in common is using highly gendered, terms “housewife, girl, mom” (along with accompanying pictures of her “dripping wet”) to downplay the risk involved in Earle’s explorations through references to domesticity. In the second heading, Earle writes that she guffawed at being called “girl” at a time when she already had three children—as though girls can explore, but mothers can’t. In wry retaliation, Earle remembers, “We even had fun rewriting some of the headlines giving the words a fresh twist, such as ‘Beacon Hill Husband Leads Team of Male Aquahunks.’”\[67\] The “we” refers to Earle and 13 other women (rather than male) scientists chosen for the Tektite

\[62\] Earle (1996), 16.
\[63\] Ibid., 27.
\[64\] Ibid., 68.
\[65\] Ibid., 76.
\[66\] Ibid., 122.
\[67\] Ibid., 69.
project based on the quality of their research proposals, primarily because there was anxiety about a gender-mixed crew. Whereas Cousteau has been framed as a daring and intrepid explorer, the element of risk has been largely downplayed in media coverage of Earle’s ventures.

Even post-aqualung diving technologies have tended to assume a normative male body, from the making of dive tables to development of special technologies like the deep-water diving suit called “Jim.” Using this hermetically sealed suit, Earle set out to attempt, “the deepest solo dive ever made without a tether to the surface” at 1250 feet.68 Her prose humorously conflates the technology (the suit named “Jim”) and its protective design with expectations of masculinity:

My first face-to-face meeting with Jim, at the Commercial Diving Training Center in Los Angeles, was not at all what I expected. From what I had heard Jim was rugged and reliable, the strong, silent type with a no-nonsense reputation for doing tough jobs in difficult circumstances underwater.69

The description of the technology is a description of masculinity, correlated with toughness, hardness, and strength. Earle notes a difference between space suits and diving suits: whereas space suits can be soft and pliable in low- or zero-pressure environments, “Jim must be made of hard materials—metal, ceramic, or composites—to resist the pressure imposed by the weight of the water above. Whereas a fully outfitted astronaut’s suit may weigh more than 100 pounds in air, Jim weighs about 1,000 pounds.”70 Further, “Jim is scaled for husky commercial divers who tend to be six feet or so tall and weigh in at 200 pounds plus.”71 However when Sylvia first “meets” Jim, he was “in pieces […] both legs

68 Ibid., 106.
69 Ibid., 100.
70 Ibid., 101.
71 Ibid., 110.
separated from the body, and one arm completely dissected.”  

72 The reason Jim was “in pieces” was because its legs were being shortened to better fit Sylvia, who at the time was 5’3” and weighed in at 110lbs. Jim was emasculated both literally and symbolically in Sylvia’s presence, not looking so “rugged” and “strong” while disassembled on the floor. Yet Sylvia’s small stature made her, in a way, an “excellent candidate” for operating Jim: “With room to spare, I was able to tuck inside a Nikon with extra lenses, a notebook, and my trusty leather Coach shoulder bag stuffed with a few essentials—an apple, Snickers bar, spare pens and film, and a rag to wipe condensation from the ports.”  

73 Earle’s body highlights the ways that large male bodies are assumed to be the norm for diving technologies.  

74 Earle’s narratives of the Tektite Project also give us important insights into the concept of saturation in relation to the interface, which we preliminarily explored with Cousteau. The Tektite Project combined living in a pressurized, underwater habitat with unlimited diving excursions (saturation diving) that could be made from the home base of the habitat. Earle recounts,  

[...] saturation diving using the Tektite habitat approached the rules in a different way, providing unlimited time at the depth of the laboratory at 50 feet, with generous excursion time downward to at least 100 feet and upward to within 20 feet of the surface. At the end of the mission, aquanauts would swim to a diving bell, a pressurized capsule open at the bottom. Once the divers were safely aboard, the

72 Ibid., 100.
73 Ibid., 102.
74 In Open Water Dive training, we learned that the dive charts for calculating safe dive time were based on male 200-lb bodies, since they were developed by the military.
hatch would be closed and the bell would be lifted to the surface while maintaining pressure.\textsuperscript{75} 

In all, Earle would have to spend 21 hours decompressing in order to have 336 hours of continuous underwater time, a sacrifice she was willing to make for the freedom it allowed unlike normal, or “stopwatch” diving.\textsuperscript{76} By spending continuous time underwater, she would get to know the fish “whose habits become as familiar as those of neighbors.”\textsuperscript{77} Earle occasionally uses the language of crossing national borders through the term “passport” when describing her trips underwater.\textsuperscript{78}

Yet becoming part of the ecology of the underwater world does not, physiologically, connote a kind of universal amphibious passport. As we saw with Jacques Cousteau, the saturation of the blood with breathed air (nitrogen/oxygen) puts a limitation on one’s return to the surface. The longer one is underwater, the more alienated, or excommunicated, they are from safe return to the surface world. One particular instance is telling through the way it describes the physiological barrier of saturation; this moment of technological failure, like the one I used to introduce this chapter, illustrates how the interface in diving works:

Of special interest was the incident I related concerning what happened when a sand-clogged regulator and a faulty reserve valve left me without an air supply more than 1,000 feet from the habitat. Sunlight and air were only 71 feet away—overhead—but I was separated from them by a physiological barrier as effective as a brick wall. Racing for the surface for air with my tissues saturated with compressed gas would spell swift disaster: bubbles in my blood, pain, possible paralysis, even death. My

\textsuperscript{75} Earle (1996), 66. 
\textsuperscript{76} Ibid., 66. 
\textsuperscript{77} Ibid., 70. 
\textsuperscript{78} Ibid., 62, 91.
options were limited to a long swim back to the habitat sharing air with my buddy, the engineer Peggy Lucas, or activating an emergency pinger to alert shore-based safety divers to try to find us and drop spare tanks.79

Earle also quotes early diving pioneer Robert Stenuit:

I have returned from a strange journey in an alien world… Living in the depths, I have become in certain ways a creature of those depths, adapted to their pressures. Now the human environment is temporarily intolerable to me. I need pressure… I must wait inside this life saving prison of a decompression tank until I have been slowly weaned… and made once more fit to live on Earth.80

Earle’s and Stenuit’s discussions of diving also point to diving as a process of becoming excluded from land—in Stenuit’s case, specifically in the maternal imagery of incubation and language of rebirth. The decompression tank serves as the “life saving prison”—read, womb or matrix—from which the human-amphibian can regain terrestrial passport, “slowly weaned” from the “alien world” of the depths. What this gives us is a picture of becoming-amphibious as not this kind of universal passport that allows us to go from land to sea, but a process of alienating oneself from the land at the very moment that one becomes more accustomed to breathing air underwater. The accumulation of gasses in the blood changes one’s status of belonging; no longer a creature of the land, one is more and more of the sea.

In a similar vein, Cousteau specifically discusses the issues of amphibiousness and the physical boundaries of belonging to land or sea when he meets a group of Greek divers. Here we might note the language of belonging, specifically as it describes ways of bodily belonging to land or sea:

79 Ibid., 75.
80 Ibid., 59.
They assured us that although they were semi-cripples on land, when they returned to the world of pressure, they recovered their agility as in a fountain of youth. The first ‘pressure stroke’ cut them off from land and condemned them to the sea, and each new seizure bound them closer to her. The relief they felt was, of course, the support of water, which eased their palsy. The sea changes the Greek divers and it profoundly changes the sunken ship. Rust advances under the paint. Weeds and animals come and live on it.

From afar it seems to be a rock. Then comes a tremor of recognition. It is a ship that has lost its pride.  

The “pressure stroke” that cut off the Greek divers from land refers to the bends, of gas bubbles getting stuck in various joints or places in their bodies. Such injury, doesn’t foreclose the possibility of returning to the ocean, but ironically binds them even closer to it, making the ascent to the surface and walking with the constraints of gravity on land that much harder. Cousteau describes the transformation of divers’ bodies as a kind of Shakespearean “sea change,” where seawater itself changes human bodies as it would a sunken ship. With the Greek divers however, it is not the chemical materiality of seawater, but its pressure effects at depth that produce the specific sea change on their bodies. “Sea-change” can be not only chemical, but also a quality of ambient pressure and breathed air. Cousteau’s Greek divers with the bends feel more “at home” in the water than on land for its gravity-reducing effects that ease the pain.

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81 Ibid., 27.
82 We might remember Ariel’s famous lines in The Tempest: “Full fathom five thy father lies;/ Of his bones are coral made;/ Those are pearls that were his eyes:/ Nothing of him that doth fade,/ But doth suffer a sea-change/ Into something rich and strange” (I.2). In this scene, Ariel misleads Ferdinand to believe that his father has drowned at sea; the description aestheticizes the drowned father’s body as not decaying, but changing almost magically into pieces of treasure. The “sea-change” is evoked not by a single agent, but by the surrounding milieu of ocean.
83 See Delbourgo (2011). James Delbourgo specifically has discussed the relations between free diving and the literal becoming-amphibious of the human body routinely exposed to seawater: for example, tougher skin, effects on the eyes, expanded lung capacity, and sometimes the crippling that comes with the bends. Delbourgo connects the practice of free diving with colonialism, noting that in the Caribbean, divers were typically natives employed to dive for sponges or valuable items that had fallen from ships into the ocean.
of walking, again showing how “becoming-aquatic” is a matter of giving up one’s “passport” to the land.

Even more than Cousteau, Earle finds perspectival value in the position of worldly estrangement offered by diving. One recurring narrative pattern in Sea Change: A Message from the Oceans is Earle’s adoption of the point of view of the alien. For Earle, scuba diving suggests an environmental ethics to the extent that it puts the human diver in the position of being an “alien” relative to the ocean, and it is from this alien perspective that one might develop a sense of respect and care. Alongside the perspectival transformations of the space race in the 1950s, Earle writes that, “several decades of underwater exploration using aqualungs and other diving techniques have permanently transformed human perspective, forcing those who have tried it to look at the earth—and themselves—with fresh eyes.”

Earle repeatedly compares ocean research to being an alien looking at Earth. In her first experience diving, she writes, “I was supposed to be the watcher, but found myself the watchee, the center of attention for a bunch of curious fish, apparently mesmerized by the strange bubbling being that had just fallen through their watery roof.”

Rachel Carson similarly has a moment in The Edge of the Sea where she comments on the experience of seeing a ghost crab at night and feeling like she was the alien seeing the crab in its world for the first time. Earle takes this feeling of observational reversal another step further, asking the reader to imagine the scientist as alien: “To appreciate the difficulties faced by explorers perched on the deck of a ship rolling through slate-green waters, imagine alien explorers flying a rocking craft slowly over New York City during a storm […] What could aliens conclude about the nature of life below from a

84 Earle (1996), 47.
85 Ibid., 43.
86 Carson (1955), 5-6.
random trawl sample?" This implies that the lucky few who do get to witness the sea’s creatures should be responsible for sharing their experiences: “Like astronauts, charged on behalf of humankind to bear witness to sights not yet within the reach of most, it seems to me that those who travel into the deep sea also have significant news to share.”

We can also see this burgeoning ethics of perspective at the beginning of Sea Change. Earle pays homage to H. G. Wells’ The Time Machine by imagining a magic submersible that would “descend through the eons” to “get a better feel for the place of humankind in the greater scheme of things and for the significance of swift changes now taking place.” Time travel is like diving, and of being in the position of the alien:

Perhaps, after returning from a visit far back into the history of the planet, certain creatures would be treated with more respect [...] Perhaps complex natural systems would be understood for what they are: the distillation of the processes of all preceding time, and the source of the ingredients required for human survival and well-being.

Here and later in the text, Earle uses the word “distillation,” a particularly watery word, to describe processes unfolding over time. As with the pre-Socratic philosopher Heraclitus, time is water. Yet instead of stepping into its ever-changing stream, Earle imagines time as a kind of vital fluid, a distilled and vital “ingredient” for human survival that might be internalized, rather than a separate river one might immerse in. For Earle, scuba diving is a technology of perception that positions the diver as alien. The human trespasser is the liminal figure that, limited by the saturation of her tissues, can only temporarily belong to the ocean before physiological conditions

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88 Ibid., 122.
89 Ibid., 5-6.
90 Ibid., 6-7.
91 Ibid., 6-7, 31.
take away her temporary passport. The temporary quality of having an “oceanic passport” creates the sense of unbelonging that promotes care of the (oceanic) other.

Narrative documentaries like Werner Herzog’s science fiction fantasy *Wild Blue Yonder* also have the viewer occupy the position of the alien, and looking at Earth from afar, as a way of cultivating care. In *Wild Blue Yonder* an “alien” visitor, played by Brad Dourif, comes to earth after his planet’s ecology has collapsed, and narrates his shock at later seeing video footage of human astronauts land there looking for an alternative world to live on. The ironic twist is that the footage of the alien planet is actually footage from under the ice in Antarctica, featuring “alien” jellyfish and siphonophores. This suggests that there is no alternative planet to live on, and that the alien’s longings for his home planet have always already been about longing for the planet that we already have. Herzog offers cinematic re-enchantment with our home planet through this kind of double vision of the Earth as both otherworldly, and home. For both Herzog and Earle, occupying the liminal position of the alien, displaced and vulnerable, facilitates an ethics of care towards the oceans.

Rethinking the interface through scuba diving offers a distinct kind of subject position predicated on alienation, temporariness, risk, and transgression of boundaries that forms the preconditions for an ethics of care. Here, it is interesting that Earle points out that the word “fathom” comes from,

the Old English faethm, meaning ‘the embracing arms.’ It was once defined by an act of Parliament as ‘the length of a man’s arms around the object of his affections,’ and later became a nautical term for six feet. As a verb, ‘fathom’ means to plumb the ocean depths, to probe their mystery.\(^{92}\)

\(^{92}\) Earle (1996), 16.
It is telling that the etymological history of “fathom” has to do with measurement by way of a human embrace, highlighting the way that fathoming as “understanding” or “knowledge” requires an intimate measure. Although in one sense “fathoming” figures as a kind of penetrative probing of the depths, in scuba diving, fathoming is flipped: the observer is “embraced” by the water, immersed in the ocean element they are measuring. To fathom is not simply to probe, but to measure oneself as an observer against new conditions of immersion—not unrelated to matters of scale that are at the heart of the Romantic concept of the sublime, of encountering enormity. This does not position the human at the center in terms of the Renaissance idea of man as the measure of things, but as a participant in a particular milieu. Diving—testing oneself in underwater environments—is not unrelated to what Barbara Herrnstein Smith has said: “Reality is what pushes back.”  

93 In diving, the observer becomes attuned to the non-visual knowledge by touch and the friction of water flowing over the body, a sensuous measure of “flesh feeling what the fish scales know.” If one of the projects of feminist science studies has been to critique the disembodied observer as a paradigm of objectivity, then the process of fathoming the ocean through scuba diving opens an environmentally-responsive, vulnerable practice of generating partial perspectives.

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93 Quoted from a graduate seminar, Spring 2010, in the context about talking about scientific constructivism versus relativism.
4.5 Fathoming the Interface

Attending to the oceanic milieu and specificity of the human body implies that there is no grand or single theory of the interface. In the case of diving, what we can say is that the interface in scuba diving is a *mobile threshold of diffused effects*. To summarize, the interface is primarily (1) non-visual, and instead somatically felt in its effects (2) a matter of duration, such that the interface changes depending how long one has been underwater and how deep (3) volumetric rather than surficial, since the whole body saturated with dissolved nitrogen/oxygen forms the interfacial area. This reformulates how we think about the interface in relation to control; instead of distinguishing between a “user” and an “interface” to exercise control over something at a distance, in diving there is no user/interface split since the diver’s body is saturated with pressurized air such that the air becomes a temporary technology of buoyancy, movement, and...
health. The special physiological conditions of boundaries and borders tied to the human body in diving involve the experience of aquatic displacement as an experience of risk and temporariness, of excommunication from the terrestrial atmospheric pressure into the pressures at new depths.

Figure 27: Maldives cabinet signing a resolution to reduce carbon emissions (2009).

As a final example of the implications of a revised concept of the interface, as a saturated volume, rather than a flat surface, I turn to the 2009 “underwater cabinet meeting” staged by the Maldives that uses “displacement” as a critical tactic for drawing attention to their endangerment. Responding to what Rob Nixon later called “the slow violence” of sea level rise, former President Muhammad Nasheed had his entire cabinet don scuba gear and descend underwater to sign a document committing to reduce carbon emissions. The cabinet meeting serves as an example of conceptual displacement with a political valence by “inverting” the closure of the governmental
“cabinet” into the open vulnerability of the ocean. It is also a science fictional gesture, showing us an image of the future—the Maldives inhabitants submerged by rising seas—in order to urge us to defer it through reducing carbon emissions in the present. The “view from below” raises questions of alterity—how are the conditions of media different underwater?—alongside questions of precarity: which communities are literally most vulnerable to sea level rise? Yet on a visual level (Fig. 27), the underwater cabinet meeting stages an aesthetics of breathing relations: divers exhale small bubbles of the very substance (carbon dioxide) that humanity as a whole is overproducing. In other words, we see the Maldives cabinet signing a document to reduce emissions of the very substance that we cannot help but exhale, but can and should reduce at the level of large scale industry. The Maldives cabinet performs the very phenomena that they attempt to delimit. The photograph thus not only shows us an image of the future (submerged islands), but of the present (human gas emissions)—a kind of uncanny shadow of ocean acidification.95

If we take this insight—that diving asks us to rethink the interface through the lungs, and the interface is a matter of gas exchange—then what we have is a means of tracing a complex ecology of air that moves between atmosphere, ocean, and self—an interface that is about the interpenetration of selves and world.96 Sylvia Earle metaphorically wrote, “The oceans are our planet’s lungs” because of the important role that marine algae play in producing atmospheric oxygen—yet as such, they evoke not surface of contact, but a saturated volume of exchange. Pulmonary media ask us to rethink the interface away from surficial exercises of control, and

95 Ocean acidification has been frequently called climate change’s “evil twin,” serving as a “carbon sink” by absorbing excess carbon dioxide in the atmosphere. As the ocean absorbs more carbon dioxide, it produces carbonic acid, becoming more acidic, and threatening to dissolve the calcium carbonate shells of animals that function as important elements of the food chain.
96 See Jesse Oak Taylor, “Auras and Ice Cores: Atmospheric Archives and the Anthropocene” (2014) for an extended discussion of historicity and breathing relations.
towards shared experiences of vulnerability and exchange that can help us better visualize the differential effects of climate change and create performative responses.
5. Conclusion

I have situated you, reader, as an epistemological amphibian. Through the constant movement between milieux—from your naturalized sense of the earth and the shock of contact with cold water, and back—I hope to have sensitized you to the ways in which the ocean changes how we think about media by requiring us to shift our sensory registers and perceptual habits to the liquid materiality of seawater.¹ I would like to suggest “amphibiousness” as an environmental approach to comparative media studies; moving beyond differences between textual instantiation—from print media verses electronic media—it focuses on the differential attunements of bodies to environmental conditions that make signification possible.

Such an approach takes to heart both the lessons of ethologist Jacob von Uexküll and anthropologist Eduardo Kohn that media, and perception, always involves the questions of “for whom” and “under what circumstances.”² This moves us away from an anthropocentric model of communication and technicity, and instead towards a radically pluralistic study of media and mediation. As I have argued in “Vampire Squid Media,” and as John Durham Peters argues in his chapter on cetaceans in The Marvelous Clouds, “media are species- and habitat-specific and defined by the beings they are for.”³ The future of comparative media studies is both zoological and elemental, attending to the conditions of possibility that enable communication.

Yet comparative media studies also needs to be, fundamentally, literary in its sensitivities. Amphibiousness is a way of speaking about the condition of being between two worlds, which necessitates a transfer of sense—the very definition of metaphor, but also of

¹ Ten Bos (2009), 74. Peter Sloterdijk has written that we are “ontological amphibians”—that the human being is a moving animal that longs to change from one element to another. Yet we are also like Maturana’s frog: epistemological amphibians, whose practices of knowing are distributed across physiology and environment. Lettvin and Maturana et al., “What the Frog’s Eye Tells the Frog’s Brain,” The Mind: Biological Approaches to its Functions. Ed. William C. Corning and Martin Balaban. New York: John Wiley and Sons, 1968. 233-258.
² Uexküll (2010), Kohn (2013).
Taking metaphor and synaesthesia seriously has been at the heart of several approaches to intuiting animal worlds. For example, Gregory Bateson and Viliém Flusser have suggested that metaphor is the key to approximating an understanding of animal communication, especially in oceanic environments. As I discussed in Chapter 2, Flusser imagines how the vampire squid might have different cultural valuations of “up” and “down” that differ from ours. Similarly for Bateson, we cannot simply “decode” dolphin, we must attend to the situational contexts of communication: “As we begin to understand the metaphor system of the dolphin, it will become possible to recognize and classify the contexts of his vocalization.”\(^4\) Yet our task is not simply one of metaphor, but also one of synaesthesia when we seek to intuit animal worlds: because dolphins “hear with their jaws and vocalize with their noses,” we are challenged to find the adequate vocabulary to approximate what perception and sensation is like for them.\(^5\) When comparative media studies becomes amphibious—when it deals with two worlds or *Umwelten* (the meaningful specificity of a world for an organism)—it must critically examine the language that it uses to describe its topics of study or risk importing the existing terrestrial biases, inflections, or assumptions that English (among other languages) already carries. The amphibious media theorist, then, takes to heart what Barbara Herrnstein Smith has clarified about truth in scientific knowledge, or the idea that theories are “nets”: “For [Karl] Popper, the net, an individually conceived conjecture, may *catch* truth. For [Ludwig] Fleck, the net, a web of shifting, intersecting, interacting beliefs and practices, *is* truth.”\(^6\) The science fictional estrangement of looking at the world of a creature like a vampire squid or dolphin—and their different orientations to their *Umwelten*—that can participate in making more apparent the

\(^4\) Bateson (1972), 375.
\(^6\) Smith (2006), 51.
linguistic nature and qualities of our “web[s] of shifting, intersecting, interacting beliefs and practices.”

However, at the same time that we celebrate amphibiousness as the critical capacity to negotiate sensibilities within two different environs, we should also recognize that amphibiousness is historically inflected by the heterogeneous effects of European colonization that framed Caribbean, African, and Oceanic peoples as “amphibious” through the practices of pearl diving. As historian of science James Delbourgo notes, becoming-amphibious for humans has specific colonial undertones: human bodies were changed by the conditions of deep-diving, resulting in, for example, toughened skin, greater lung capacity, damaged hearing, and crippling effects of the bends. Karel Capek’s science fiction novel *The Newts* similarly portrays amphibious newts as an exploited class of workers that eventually rebels against their human overlords. Thus certain cultural and class differences undergird specific amphibious practices and their “reversability”—whether one becomes temporarily amphibious by donning scuba gear that one can take off later, or whether one performs the kinds of underwater work that risk permanent bodily transformations and endangerments. That which best characterizes the figure of the amphibian, then, is not a kind of unlimited passport of movement between two worlds (even though two worlds must be negotiated), but rather an element of risk and somatic vulnerability.

This vulnerability should be key to how we understand amphibiousness as a figure for the critical and comparative practice of studying mediation—a necessary vulnerability, sensitive to human histories and the lived realities of literal amphibians. For example, the amphibian’s skin is radically open to the environment; being permeable to water, amphibians can cutaneously respirate, or breathe through their skin. This vulnerability is what makes amphibians good

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7 Delbourgo (2011).
8 Capek (1936/1999).
“indicator species,” used as indexes of environmental health because they are often the first and most obviously affected by water pollution absorbed into their bodies.\(^9\) Being “of two worlds” is always, at the material level, a utopian fiction that can sometimes obscure the friction and flows between bodies and environments—an attentiveness to materiality that evokes Stacy Alaimo’s concept of trans-corporeality.\(^10\)

An amphibious epistemology, then, not only negotiates the medial differences between two habitats, but the consequences of material traffic between habitats and bodies, especially those causing mutations and “irregular” metamorphoses. The images most often associated with these mutations are of frogs and salamanders that have grown extra appendages or sex organs. These scar-less mutations might remind us of Catherine Malabou’s concept of “plasticity,” an explosive transformability or regenerative ability from within that challenges Derridean senses of writing and trace.\(^11\) Although mainly working within the context of human biology and neuroscience, Malabou briefly takes a literal amphibian as an example in one chapter in Changing Difference (2011), discussing the strangeness of the salamander’s tail that, when broken off, regrows without any perceivable marks or scars.\(^12\) Rey Chow suggests that we might call this ability to regenerate from within, or regrow without a scar, “imprintless connectivity,” a kind of residual tissue that bears no inscriptive marks. For me, Malabou’s and Chow’s examples point to more heterogeneous, material ways of considering what “remains” than inscriptive cuts made on solid objects and flesh that can bear them—we might consider also non-inscriptive forms of signification. The terms I have arrived at through conceptual displacement—residue

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\(^9\) As Kermit the Frog has said in a different context: it’s not easy being green.

\(^10\) Alaimo (2014).

\(^11\) Of course, the force of Malabou’s etymological argument about “plasticity” as explosive only works through tracing the term to Latin; the same connotations do not exist in Chinese, for example, where “plastic” (a more recently coined term) has to do with molding, forming, and gluing, but not explosiveness.

\(^12\) Malabou (2011), 67-89.
(Chapter 2), cultivation (Chapter 3), and saturation (Chapter 4)—offer alternatives to the dry terms in media theory and ask us to think about other materialities. What can we learn from media, either designed or natural, that are by nature ephemeral?

Throughout *Wild Blue Media*, I have shown different ways of using the environment to rethink concepts in media theory through the movement of displacement; yet the catch is that we have already been using these terrestrially-biased concepts, like the archive, to describe the environment as media. One need only think of the poignant scene in the documentary *Chasing Ice* where one cinematographer goes to a camera mounted for months in the Arctic, pulls out its memory chip, and looks away distantly saying that the chip is all that is left of a glacier that has now melted away, a natural archive now gone except for its traces left in the camera film. There is thus a feedback loop between terrestrially-inflected conceptions of media—like archive and database—and medial conceptions of the environment. A medial vocabulary of inscription, storage, interface, and information already saturates our understanding of natural spaces and organic bodies. What this indicates to me is that one of the new horizons for comparative media studies—and media theory broadly—is not limited to the convergence of our recording methods in digital modes of storage; if we want to address the chaotic unfolding of global climate change, of saturated seas and accumulated airs, then the future of environmental media theory is analog.
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