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Review of “Helmreich, Stefan. 2023. A Book of Waves. The Lewis Henry Morgan Lectures. Durham: Duke University Press.”

Cultural anthropologist Stephan Helmreich’s steady outflow of brilliant ideas in part is testimony to his deep knowledge of theoretical whims, allowing him to uncannily release fresh work just when people seem to tire of the latest fad. Like when everybody is tired of understanding or anticipating the next turn in anthropology, Helmreich offers the “oceanic churn!” “A Book of Waves,” the third monograph by Helmreich, shows how to think with waves. Helmreich first learned to read waves as a bodysurfer. As an ethnographer of science, he set out to study them in depth. The result is a thorough reading of waves and how they “convolve” ocean scientists’ subjectivities, markets, and planetary crises. The book is the result of his Lewis Henry Morgan Lectures at the University of Rochester, which were presented about ten years ago. Beautifully designed and typeset, it situates itself somewhere between science and technology studies, infrastructure studies, and new materialism, introducing us to a mode of thinking and writing that deals with scientific concepts and material forces that “rescript worlds and futures” (304).

To collect data for his ethnography, Helmreich follows waves around the globe, a little like the white surfers in the “Endless Summer,” the 1966 American surf documentary that “glorified the virtue of exploration and glossed over the viewpoints of the local population it portrayed” (Hough-Snee and Sotelo Eastman 2017:98). Only Helmreich turns the gaze back at scientists, funding bodies, and surfers, finding alluring examples of waves at conferences, in archives and laboratories. In particular, wave simulation centers capture his attention as they produce avatars of waves that variously act as reminders or harbingers of looming disaster. Readers learn to ponder waves like wave scientists, the main figures of the book. They hold significant knowledge, since waves govern maritime traffic, erode port infrastructure, or produce good surf. Waves carry code for geomorphological movement and chemical propagation. Knowing waves thus translates into specific forms of power: military, territorial, and ecological. The book might want to teach readers how to become wave-literate themselves, to read something that is not written, but that carries substance, that is,

meaning, announcements, and subject (matter). Over time, we begin to understand that the wave is much more than a natural or material phenomenon. It is a cultural phenomenon, or as Helmreich puts it, a kind of media. If we were wave-literate, we'd see that human kind is enmeshed with the wave and it *is* breaking.

To understand waves as media, Helmreich mobilizes a plethora of methods: visual analysis, studying media and video material, interviews, participant observation. Most often, he is "studying across" at conferences, on research vessels, and at wave simulation centers. The diversity of his methods is in line with his message: there is a multiplicity of waves. Despite six meaty chapters, the perspective of scientists predominates. In the following, I will outline the chapters, while trying to spotlight moments where non-scientific perspectives on waves glimpse through.

In chapter 1, Helmreich explains how waves became an object of study in Europe. Studying human attempts at understanding and domesticating waves led him to the Netherlands, a nation "that sits, one third of it, below sea level" (31). The Dutch have a long tradition of monitoring waves. The Dutch Waterloopkundig Laboratorium, established in 1927, allowed scientists to artificially generate wave flumes and observe their effects on miniature models of ports. Visiting this lab, a monument to modern wave modeling, Helmreich reflects on dreams of "doubling, shrinking, and taming the wildness of water" (35). But complex mathematical and computational wave models seem unfit to capture the complicated behaviour of waves. They are animate entities. While this animacy sneaks into wave models, it also requires bracketing coastal dynamics, "keep[ing] nonwatery infrastructure in stable focus" (54). The lab's waves allow Helmreich to trace out a process of enculturation reaching deep into the fabric of Dutch nationalist identity. He rightly points to the imperial character of this wave knowledge, since Dutch hydro-expertise is now marketed all around the world, especially in flood-stricken countries of Asia. Here, Dutch wave knowledge and alleged cohabitation with water legitimizes international marketization of flood control. As such, the chapter makes interesting links between dreams of governing the sea and dreams of forming society. Universalizing wave knowledge, by introducing a standardized measurement of wave propagation to diagnosticate "surf similarity" across oceans, provides legitimacy and access to resources. Basins rebuilt to scale in Delft enact potential flooding scenarios, but this

enactment not just anticipates domestic risks – it also generates profits in far-flung places. Helmreich catchily suggests seeing artificial waves as "zombies," uncanny doubles that are resurrected from the dead only to be crushed again. A surplus population in the army of the postcolonial master. The chapter certainly helps familiarize waves, but other than learning about scientists and their gadgets, we don't get acquainted with the Dutch – what is their relation with historical killer waves; are they haunted by monstrous waves? Do they themselves consider waves as infrastructure, a compelling idea that Helmreich pitches at the end of the chapter, where the Sand Motor enrolls seawater to engineer sand deposits to shore up Dutch claims to cohabiting with the North Sea? Early on in the book, waves that oscillate between immaterial media and material impose their ambivalence on the clarity of the argument.

After being introduced to a formalist knowledge of waves that tries to understand their varied semiotic and cultural roles in rather abstract terms, we board the FLIP, another astounding and swimming lab. Aboard this futuristic vessel, researchers find themselves amidst real waves, or "moving ecologies" (58). Reading them means commanding an array of instruments, such as buoys and a fleet of underwater vehicles and planes. "Flipping the ship" is not about the ship stripping business in the Afrasian Sea, but researchers' changing orientations to their work which requires recalibrating the demands of wave science to personal ambitions, values, and one's career. Given the problematic provenance of funding for FLIP (the military-industrial complex), Helmreich acknowledges the necessity to navigate one's career and politics (100) around such questionable support. Just what this orientation exactly means for his own research remains a mystery, which feels like a wonderous oversight given the author's long-term employment with MIT, an institution infamous for raking in hundreds of millions in research contracts with military and corporate actors. In this chapter, Helmreich also pays attention to the gendered nature of this labour as well as its imperial origins, seizing the moment to lay bare the origins of his own infatuation with waves. Looking back, Helmreich tenderly describes them as "shimmering promises, hyperreal translations of the virtual (the perfect wave) into the actual" – "as invitations to self-actualization across an open future" (99). His obsession with and romanticization of waves stands in contracts with treating them as infrastructure, which is something US institutions commonly do. Their imperial projects relied and continue to rely on beneficial

environmental conditions for, say, military invasions or expanding the reach of diplomacy. Today, scientists also turn to waves as composite infrastructures of bacterial spread to understand the health of the sea and "possible ocean futures." I liked the contradictory role of waves for actualizing and preventing certain futures. Waves can be conduits to personal utopia and collective dystopia.

Operating wave-making infrastructure to transpose hydrological models onto reality forms the empirical backbone of the third chapter. Here, another open-air lab is allowing "textbook wave guys" (which is how one civil engineer refers to himself, p. 174) to make waves come alive – this time eerie simulations of tsunamis. Helmreich convincingly shows how simulating waves means claiming a specific knowledge of places. Through reverse engineering, engineers want to approximate the potential destructiveness of tsunamis for coastal Oregon, a region threatened by the consequence of large earthquakes that might cause the sea floor to displace massive quantities of water. Lab engineers practice a "back-and-forth between such models and the world," not that different from anthropologists trying to ground theory in the vagaries of everyday life. "Thinking at different scales, in other words, makes similarities and differences slide in and out of view." Once again, readers might wonder what locals do with this knowledge? We get glimpses of this through a shop owner's prepped emergency pack and restaurant names. Just how this spike in awareness is turned into profits remains unexplored. How significant are tsunami scenarios for elections, home-making, and coastal life, in general? How does one live with the massive seawalls that are being constructed in Japan, Indonesia, and, perhaps soon, in the Pacific US? What is perhaps missing from the bigger picture presented in this book, then, is captured by an interlocutor portrayed in the next chapter, when they talk about the "coastal side of things, […] where what you might call the anthropological aspects actually start to drive the research…" (219).

How computationally modeled waves help 'stand watch' in a world in and constituted of flux is discussed in the following chapter. Based on hanging out with employees of WAVEWATCH, "the world's most widely used simulation and prediction platform for ocean waves" that can accommodate high-speed numerical analysis of recent ocean monitoring and make predictions, Helmreich shows how wave forecasting requires re-mediating and re-formalizing waves. Remediation and re-formalization interlace human and technological renderings of

waves while leading to rather abstract representations. It is abstracting waves from their temporal and spatial context that makes them interchangeable and comparable. The work ethos of the company is particularly interesting: they want to keep software accessible and universally available so that it can recruit people in "communities of practice" (217). Helmreich accurately calls this community a "wave polity," a realm of sovereignty constructed from traded knowledge, prediction, and a shared ethics of accessible technology. Of course, computational knowledge of waves doesn't neatly map onto reality. As the previous chapter showed, nearshore currents produce highly specific, idiosyncratic waves. On page 228, the sediments and pollutants-carrying river allows Helmreich to remind us that water is always "convolved with the material world" and escapes full rationalization. These excesses and disturbances of models are what fascinates wave scientists, it doesn't frustrate them. It also fascinates a growing community of citizen scientists whose involvement in observing the sea introduces an embodied and localized knowledge of waves. Of course, excess water can mean doom for millions of coastal dwellers living in chronically flooded downstream areas, who closely monitor the specific dynamics of shore waters. This is what the next chapter tries to take up.

Here, Helmreich describes how wave scientists working in the Southern Hemisphere paddle against biases and trends in a discipline dominated by Western physical oceanographers. Helmreich is curious whether there might be proponents for a Southern penchant in wave theory, which means thinking futures from waves in neglected oceans. In addition to being less mixed up with human endeavours or centralized, capitalist maritime infrastructure (273), wave heights and other biological specificities of the Southern Hemisphere oceans also make them stand out. Anthropology has certainly played a role in differentiating Southern from Northern seas in the global climate imaginary, as they predominantly documented threats to insular lives and tsunami recovery in this region of the planet. The Southern oceans were, then, both a proxy for empire and for theorization. Aware of the legacies of colonization, struggles for independence, and international development efforts, Helmreich presents wave effects in the Bay of Bengal as "vital entities through which to query and reorient wave theory" (285). Today, waves write stories that tell global tales of climatic upheaval as much as they conjure the "planetary," as Helmreich convincingly argues, since waves condense geological as well as global forces to the extent that "waves – rising

surging, rolling – can now be read as materializations of climate changes in littoral Asia" (280). Importantly, they materialize as swells of trash and pollution that lastingly transform nearshore habitats into sickened ecologies, ailing from "churning, confused time" that harbours chronic risk and disease. And yet, chalking waves off to climate change is a misreading, as Helmreich points out, drawing heavily on Camelia Dewan's (2021) work on hydrological interventions into the Bengal Delta.

Water literacy is a skill that ethnographic work can help develop, as this book shows. A Book of Waves teems with materialist understandings of animacy and agency. And yet, the literacy that this book develops doesn't sufficiently center the material side of things. If these brackish, sluggish, chimeric entities constantly exceed nomenclatures, computational possibilities, and formula, how does their behavior also question baseline notions of materiality, of both water, ground, and waves? Instead, we are left with waves as harbingers or messengers – in other words, remediated media. But how significant is a book about "significant" waves when it skirts questions about material outcomes?

Bibliography

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