

ACKNOWLEDGMENTS

During the fieldwork for this book (2015–22), I became a drone pilot, logging over a hundred hours of flight time in locations around the world: the United Kingdom, Iceland, Denmark, United States, Indonesia, Sri Lanka, and Australia. You could say I was seduced by the techno-utopian discourse of entrepreneurs like Chris Anderson, who left the editorship at *Wired* magazine to start the drone company 3D Robotics and evangelized: “We are as yet tourists in the air, briefly visiting it at great cost. By breaking the link between man and machine, we can occupy the skies” (C. Anderson 2017). Anderson’s aspiration resonated with icons in my development: Stewart Brand’s *Whole Earth Catalog*, Jacques Cousteau’s marine conservation, Carl Sagan’s vision of our interplanetary future—my thanks go to my mother, Jennifer Fish, for exposing me to these visionaries at a young age. Such early influences coalesce in this book on human-scale technology, the ocean, and becoming a mature planet.

My first drone experiment from 2015 to 2017 was designed to enhance “infrastructural literacy” (Parks 2009) by creating a visual travelogue of the undersea fiber-optic system that connects Iceland, the United Kingdom, and Denmark. The discoveries from this research foreshadowed findings in *Oceaning*—namely, that drones are entangled by what they engage and conditioned by the environments through which they fly. We lost control of a drone because of its reaction to magnetic fields emitted from black sand beaches in Iceland (or so we imagined), and I witnessed the communicative parallels between the networked technologies of drones and the sonar of pilot whales in the Faroe Islands. These flights and crashes showed the elemental contingencies of exploration (Fish and Garrett 2019; Fish, Garrett, and Case 2017a, 2017b; Garrett and Fish 2016). My appreciation goes out to Dr. Bradley L. Garrett for partnering in these and other projects and for introducing me to drone piloting. Páll H. Vesturbú was instrumental in visiting the internet’s points of presence in the Faroe Islands. A visiting professorship at the University of Iceland, courtesy of Hafsteinsson Sigurjón, grounded me during the fieldwork in 2015.

A Leverhulme Trust Research Fellowship (2017–18), in the UK, enabled me to conduct ethnographic work into drone culture in northern Europe, Indonesia, and Sri Lanka. At the time, I was faculty at Lancaster University in the sociology department, a conducive place to study the politics of science and technology. My sincere thanks go out to Dr. Monika Buscher, Dr. Tim Dant, Dr. Bulent Diken, Dr. Bruce Bennett, Dr. Graeme Gilloch, Dr. Adrian Mackenzie, Dr. Corinne May-Chahal, Dr. Lucy Suchman, Dr. Imogen Tyler, Dr. Claire Waterton, Dr. Benjamin Neimark, Dr. Luca Follis, Dr. Karolina Follis, Dr. Brian Wynne, and Dr. John Urry. Releasing a video-enabled helium balloon with Dr. Bronislaw Szerszynski and somehow finding it in a backyard a hundred kilometers away was typical of the type of experimentation encouraged at Lancaster University. The Centre for Mobilities Research, the Institute for Social Futures, Security Lancaster, and the Faculty of Arts and Social Sciences at Lancaster University, as well as COST: European Cooperation in Science and Technology, deserve thanks for being early supporters of this scholarship.

During 2018–19, I navigated with drone inventors, humanitarians, and environmental activists as they piloted drones during crises. Environmental and land-rights advocates in West Papua, Indonesia, steered drones to record riverbank erosion caused by palm oil plantations. They documented their traditional arboreal gardens and surrounding peat swamps—all preemptive efforts to map their lands before the plantation owners rolled into the area, demanding land concessions. I assisted these operations, bringing pilots and engineers together with local activists and drones (Fish and Richardson 2022; Fish 2023). As a documentary filmmaker, I saw the immense possibility in this flying camera, while as an activist, I recognized how the drone could be a tool for radical transparency, a way to peer down into what geographer Doreen Massey (2004) calls the geographies of responsibilities and power. As an anthropologist, I was witnessing the emergence of a multisited public of cultural production, science, and technology. I would like to thank Dr. Irendra Radjawali and Hagarly Hutasuhut, both of the Bandung Institute of Technology, for their efforts in enlightening me about the potentials of atmospheric technologies in Indonesia.

While we were in Indonesia, the Agung volcano on the island of Bali erupted, and Aeroterrascan, an Indonesian drone company I was working with, donated their time, personnel, and technology. We operated drones over the volcano and looked into the crater to ascertain the severity of the eruption. What we saw encouraged the government to relocate sev-

enty thousand people away from the epicenter. Later, I elevated drones over coral reefs in Bunaken National Marine Park in Sulawesi, Indonesia, documenting coral bleaching. Throughout these missions folks at Aeroterrascan—Dian Rusdiana Hakim and Feri Ametia Pratama—were generous with their time and my inadequate Bahasa Indonesia.

In Sri Lanka, I worked alongside conservationists defensively arming local farmers with drones so that they might frighten marauding Asian elephants (*Elephas maximus*) away from their fields and homes, saving themselves, their livelihood, and the elephants from a more lethal deterrent. The team at the Sri Lanka Wildlife Conservation Society, in particular Chandima Fernando, provided key insights into the potentials for drones in conservation.

The ideas in this book came together in the urban centers of Germany during a senior research fellowship at the Weizenbaum Institute for the Networked Society, at the Technische Universität Berlin, with Dr. Stefan Ullrich from 2018 to 2019 and a research fellowship at the Zemki Centre for Media, Communication and Information Research, University of Bremen, with Dr. Andreas Hepp in 2018. During this time I was fortunate to receive invitations from Dr. Johan Lindquist to speak at the University of Stockholm, Department of Social Anthropology; Dr. Tora Holmberg at Uppsala University, Department of Sociology; Dr. Patrick Vonderau at the University of Halle-Wittenberg; Dr. Paula Bialski and Dr. Götz Bachmann, then at Luephana University; and Dr. Philippa Lovatt at St. Andrews University. Helping to refine this book's concepts were additional talks at the News and Media Research Centre, University of Canberra; the Mobile Life Center at the Stockholm University; Technologies in Practice Research Group at the IT University of Copenhagen; the Social Anthropology Department at the University of Edinburgh; and the Institute for Advanced Studies in the Humanities and Social Sciences, National Taiwan University. I would like to express my gratitude to Dr. Beryl Pong for inviting me to give a keynote at the National University of Singapore's New Technologies Research Academy.

In 2019, I accepted a research position at the University of New South Wales, a university near the surprisingly undomesticated urban shoreline of headlands, bays, and beaches of Sydney, New South Wales, Australia. This book's conceptual framework began to concretize in Australia, where I found a research ecology steeped in environmental humanities and an ethnographic approach to multispecies studies (Van Dooren 2014; Rose 2011; Plumwood 2001). Sharks regularly patrol the shores while whales

migrate north and south, and the coral of the Great Barrier Reef is two days' drive north. These animals are not distant specimens but strangely perceptible, in reach and in sight—perhaps too close for some. In Australia I have been fortunate to hang with drone-curious academics Dr. Edgar Gomez Cruz and Dr. Michael Richardson, who provided beachside opportunities for critical reflection on the purpose and potentials of these new technologies. The University of New South Wales's Scientia Fellowship program and Dr. Michael Balfour, in particular, generously provided me with the time to conduct this fieldwork, write this book, and participate in artist residencies. As I explored the drone's videographical capabilities, it became as much a writing as an artistic project. I was fortunate to work with two clans of brilliant artists at the Four-plus one: the Elements, Kinono Artist residency in Tinos, Greece, in May 2022 and the Field_Notes-The Heavens, Bioart Society, Kilpisjärvi Biological Station in Lapland/Finland, in September 2019. My thanks go out to the Open Eye Gallery in Liverpool, UK, for screening my film *Organic Machine* (2020) in January 2022 as part of the Look Climate Lab. I acknowledge those who screened my documentary *Crash Theory* (2019) about tumbling drones and collapsing ecologies. Likewise, I celebrate those who brought our *Points of Presence* (2017) documentary on information infrastructure in the North Atlantic, produced with Bradley L. Garrett and Oliver Case and music by Jon Christopher Nelson.

In Australia, I launched into a public of ocean drone hobbyists, scientists, entrepreneurs, and activists. I began conversing with people like Dr. Vanessa Pirotta, a marine biologist at Macquarie University who collects whale breath with drones; Jonathan Clark (of the Sea Shepherd Conservation Society in Australia) and Andre Borell (shark activist and filmmaker), who both advocate for the use of drones to alert swimmers of sharks' presence instead of using nets and hooks to kill and capture sharks; Gary Stokes, who flies drones and identifies illegal shark fishing in Timor-Leste and ghost nets near Hong Kong; Nora Cohen, previously of the Obama White House and now of Saildrone in San Francisco; and Dr. Karen Joyce, a coral drone scientist who started the crowdsourcing drone platform Geonadir. My thanks go out to these scientists and activists for their efforts in conservation and in enlightening me about their work.

Through interviews, I began to investigate the Sea Shepherd Conservation Society's long history of atmospheric and oceanic technologies in acts of direct action on the open seas. Their numerous television

programs and feature-length documentaries reveal the innovative and sometimes terrifying applications of conservation technologies in the Southern Ocean to defend Antarctic minke whales (*Balaenoptera bonaerensis*) and the vaquita porpoise (*Phocoena sinus*) in the Sea of Cortez, Mexico. Dr. Pirotta's use of drones led me to Ocean Alliance, founded by Dr. Roger Payne, famous for his studies of humpback whale songs. I discovered through several conversations that, like Sea Shepherd, Ocean Alliance had long used a wealth of different technologies to get closer to and know more about whales. Shifting from shooting a crossbow at a whale to collecting skin and blubber samples, Ocean Alliance and their chief scientist, Dr. Iain Kerr, navigate drones to fly through the stinky exhalation of whales. To expand my understanding of how different drone technologies are affected by the elements, I visited the National Oceanic and Atmospheric Administration in Seattle and spoke with oceanographers Dr. Calvin Mordy and Dr. Carey Kuhn, who direct semiautonomous sea surface drones toward northern fur seals. I thank them and the many other drone pilots with whom I talked for their help in this project.

The ideas in this book have diffused across various other projects. Chapters 2 and 5 are particularly indebted to my 2022 article "Saildrones and Snotbots in the Blue Anthropocene: Sensing Technologies, Multispecies Intimacies, and Scientific Storying" in *Environment and Planning D: Society and Space* 40, no. 5 (October): 862–80; chapter 3 to my 2022 article "Blue Governmentality: Elemental Activism with Conservation Technologies on Plundered Seas" in *Political Geography* 93, art. no. 102528 (March): n.p.; and chapter 6 to my 2021 article "Crash Theory: Entrapments of Conservation Drones and Endangered Megafauna" in *Science, Technology, and Human Values* 46, no. 2 (March): 425–51. Gratitude to the editors and peer reviewers for the help on those articles.

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