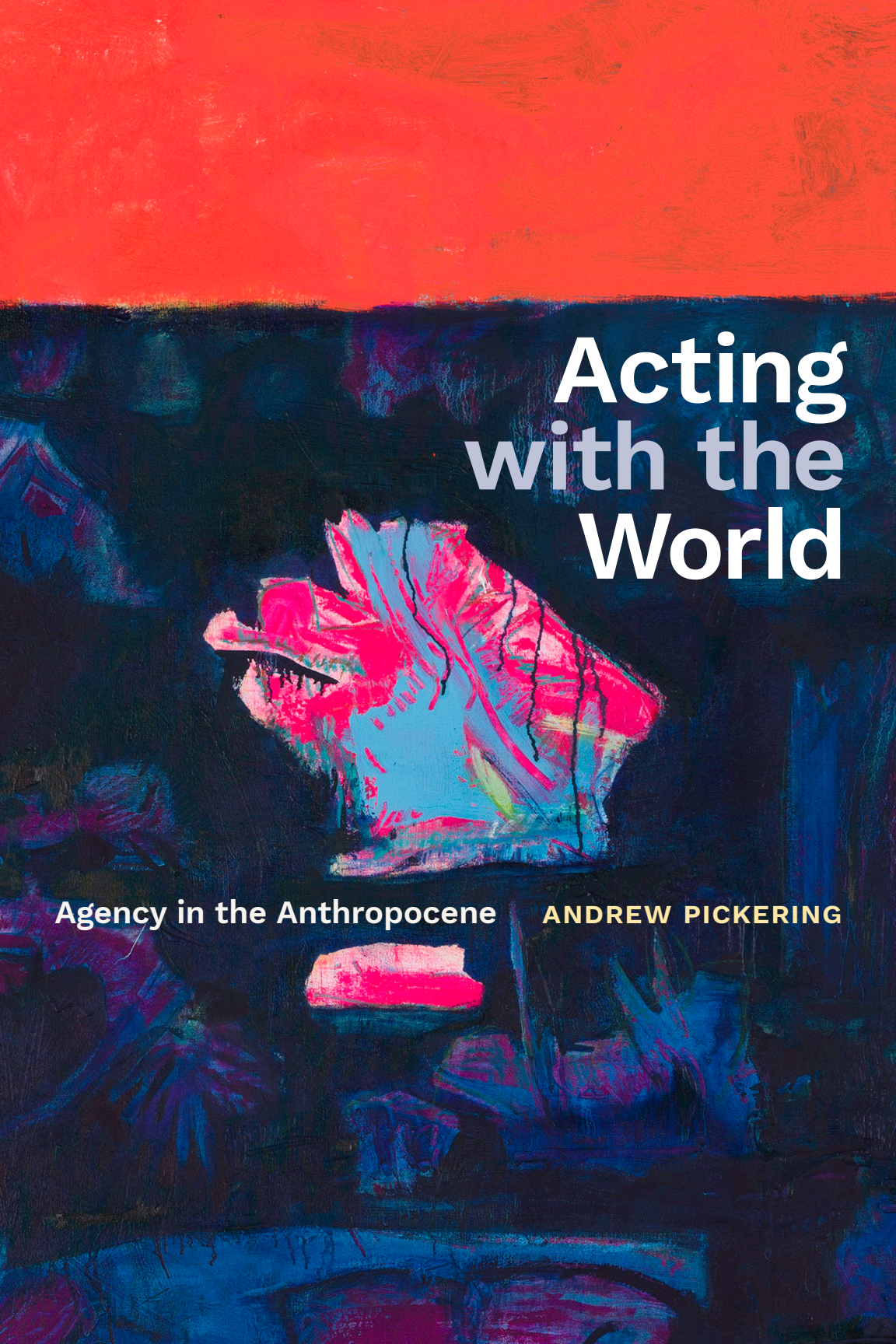
Acting with the World
Agency in the Anthropocene
ANDREW PICKERING

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AGENCY IN THE ANTHROPOCENE

Andrew Pickering

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Contents

As individual animals we are not so special, and in some ways the human species is like a planetary disease. —JAMES LOVELOCK, *The Revenge of Gaia*

What shall we do? No one yet knows. Unless we think about fundamentals, our specific measures may produce new backlashes more serious than those they are designed to remedy. —LYNN WHITE JR., "The Historical Roots of Our Ecological Crisis"

A new paradigm would have to take up practices that are now on the margin of our culture and make them central. —HUBERT DREYFUS, "Heidegger on the Connection between Nihilism, Art, Technology, and Politics"

I would like to cultivate a charisma of uncertainty, a charisma of admitting that you're making it up as you go along.... I think we're in for a hard ride for maybe half a century. Then it will either be the end of civilization or a reborn humanity with a different set of ideas about who we are and where we belong and how we must relate to things in order to survive. —BRIAN ENO, quoted in David Marchese, "Brian Eno Reveals the Hidden Purpose of All Art"

Living with and dying with each other potently in the Chthulucene can be a fierce reply to the dictates of both Anthropos and Capital. —DONNA HARAWAY, *Staying with the Trouble*

Preface

All my subsequent work has grown out of a book I published in 1995, *The Mangle of Practice: Time, Agency, and Science*, in which I drew on case studies of scientific research to develop a general story of what the world is like, a worldview, an ontology. What has fascinated me ever since is that the worldview I spelled out there was different from that of the physicists I had been studying. They took it for granted that the world is built from fixed and knowable entities like quarks or strings or black holes, while the world I found myself describing in *The Mangle* was fluid, always evolving and becoming something new.

At first I did not think much about that. The scientists had their worldview, I had mine, and that was OK. But then I started to take the divergence more seriously. I began to think we were both right. I was right to say the world is a place of open-ended becoming — you just have to look to see that — and that the scientists themselves indeed live in that world. But at the same time, they imposed on their work the objective of discovering more-or-less stable findings in the flux — islands of stability, as I later called them (Pickering 2017b). Only more-or-less stable facts, instruments, and machines are allowed to count as the products of science: Newton's laws, electrons, bubble chambers. To find any such islands is a heroic achievement, but the price is to conceal all the evolution and becoming that I felt we need to talk about — in order, even, to understand how science itself works.

So what? One can, I suppose, be interested in ontology as a topic in its own right, but at this point I started to wonder what sort of implications different ontologies have for *practice*, for how we *act* in the world. It seemed to me that modern sciences like physics and chemistry are, so to speak, predicated on a dualist ontology that makes a clean split between people and things, in the sense that maintaining this split is the criterion of successful

science. Would we perhaps go on differently if we assumed instead an ontology of becoming?

At first I was baffled by this question, but in the late 1990s, I came across an odd and almost forgotten science (if it is a science) called cybernetics, which shared my view of the world as an ultimately unknowable space of open-ended transformation. And, crucially, the cyberneticians put this worldview into practice — they brought it to life and acted it out in all sorts of projects in all sorts of fields running from brain science, psychiatry, and robotics to management, the arts, even spirituality. These projects showed me what I had been unable to imagine, what a mangle-ish ontology could look like in practice. I found them fascinating in their difference, their strangeness, their departure from their conventional equivalents, and their imaginative quality — I could never have made them up. I looked, for example, at adaptive architecture, buildings designed to become something new, to change shape in response to how they were used, and antipsychiatry, an approach in which the psychiatrists lived communally with the mad in processes of reciprocal adaptation, rather than prescribing them drugs or shock therapy.

I felt that I had turned up a new paradigm, a new world — a new way of grasping and acting in the world — very different from the usual ways of doing things that I was familiar with, all interlinked via the ontology of becoming I had developed earlier. And I was drawn to this paradigm. I liked the idea of buildings that changed shape; it would be interesting finding out where the kitchen had gone when I woke up in the morning. Antipsychiatry was controversial, but I admired men and women who would try to help very disturbed people by living with them and transforming themselves in the process. So I wrote a book, *The Cybernetic Brain: Sketches of Another Future* (2010), tracing out the main lines of development of cybernetics since its first appearance in the 1940s, especially as it had evolved in Britain.

Since then, much of my work has focused on tracing out further the contours of a neo-cybernetic paradigm, without worrying too much whether the projects I examined called themselves cybernetic or not. I have followed two leads in particular. One concerned unconventional cybernetic artworks that somehow show us that we live in a lively world of endless becoming, as a kind of ontological pedagogy (Pickering, forthcoming a). The other is the topic of this book and concerns our relations with nature and the environment.

My inspiration here was Gregory Bateson, one of the first generation of cyberneticians. He featured in *Cybernetic Brain* by virtue of his connection to antipsychiatry (and Buddhism), but I also knew that later in his life, in the late 1960s, Bateson was part of the environmental movement in the United

States (G. Bateson 1968, 2000b; M. Bateson 2005). He felt that the environmental crises of the time, crystallized in Rachel Carson's *Silent Spring* (1962), were just surface symptoms of a deeper malaise in our relations with nature and that we needed to engage with nature differently.

Bateson's main concern was with ontology, arguing against the dualist worldview and in favor of a recognition of couplings of the human and nonhuman worlds — "the pattern that connects," as he put it (G. Bateson [1979] 2002). Unfortunately, from my perspective, he offered few suggestions for novel forms of nondualist practice. But his work encouraged me to look for neo-cybernetic ways of getting closer to nature, acting with rather than on the environment, ways that would sensitize us to the world we are irrevocably plunged into, rather than, as Bateson feared, cutting us off from it. As before, I started coming across examples of this new paradigm, now in our relations with nature, and the present book is about what I found. At its heart are a series of studies set out in the following chapters, which touch on earth, fire, and water (though not much on air) and, in the end, spirits.

I can think of several reasons for being interested in these. (1) They are simply and systematically different from our usual patterns of action. I find them surprising and new in ways that are worth contemplating. (2) They show us that we have a choice. Our usual ways of going on are not dictated by the order of things; we can therefore act differently if we want to. (3) The environmental crises that worried Bateson have only gotten worse since the 1960s, with global warming as the poster child. A choice of acting differently — and less perilously — is thus more valuable than ever, though I should say now that I have no quick fix to offer for the ills of the Anthropocene. (4) They bring us closer to nature, reminding us of our inseparable coupling to it and even rejoicing in that, attuning us to its ways. In the end, that might be what we need most.

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I began the first draft of this book during the coronavirus years — a solitary affair — but before that much of the thinking grew out of my undergraduate and graduate seminars at the University of Illinois at Urbana-Champaign and the University of Exeter, and I thank the students who took part in them. They will recognize some of the studies that follow, but I have taken them further and hope to have made more sense of them. For input, feedback, conversation, and enlightenment, I want also to express my gratitude for individual contributions from Lisa Asplen, Antonio Carvalho, Dawn Coppin,

Giovanna Columbetti, John Dupré, Adrian Franklin, Regenia Gagnier, Steve Hinchliffe, Casper Bruun Jensen, Pablo Jensen, Bruce Lambert, Lenny Moss, Paul Pangaro, Simon Penny, Brian Rappert, James Rice, Chris Salter, Ernesto Schwartz-Marin, Tom Smith, and Chris Welsby. In 2022, Steve Hinchliffe organized a group discussion of the first draft of this book which fed importantly into the present version, and I am very grateful to Steve and the participants for that. At Duke University Press I thank Ken Wissoker, Ryan Kendall, Bird Williams, and two anonymous readers. Lastly, my thanks go to Lenny Moss and Paul O'Connor for the gift of office space on campus — greatly appreciated!

Introduction

Acting on or with the World

The topic of this book is an unfamiliar pattern of action that I call *acting-with* or *poiesis*, a pattern that entails paying attention to the tendencies of the world, incorporating them into our ways of going on, and tuning our own activities into them. The goal of the following chapters is to exemplify acting-with in our relations with nature and the environment — to bring poiesis to life in the time of the Anthropocene. Along the way and to emphasize the distinctive aspects of acting-with, I find it necessary to discuss a contrasting and much more recognizable pattern of action that I call *acting-on* or *enframing*, but I should say now that my goal is *not* a balanced and comprehensive portrayal or critique of acting-on; my central concern throughout is acting-with.

Acting on the world is the very familiar stance of mastery and domination that is the hallmark of modernity and which has brought us both modern science and the vast array of machines and technologies that underwrite the knowledge and power of the modern West. It is not to be taken lightly. But it is increasingly recognized that acting-on also has a dark side. In the Anthropocene, technological disasters, pollution, extinction of species, floods, fires, and global warming appear as corollaries of mastery and hubris. We are great at converting fossil fuels to mechanical power and electrical energy, for example, but we are also great at simultaneously producing carbon dioxide and climate change as an unintended and unwanted spin-off. Many people now feel we have gone too far along this trajectory and that it needs to be resisted, stopped, blocked in its tracks — Extinction Rebellion and Just Stop Oil being the most visible recent manifestations of this.

I share these sentiments, but I am no expert on resistance and I have nothing new to say about it. Nor am I concerned here with technological fixes from geo-engineering to solar power. I see them as still part of the acting

on, dominating paradigm (though now in a therapeutic spirit). In contrast, I want to open up a different and less familiar space. I want to look at a level below that of domination, resistance, and technological fixes. I want to examine another pattern of acting in the world, acting-with. I want to signal the possibility of *systematically different ways of acting in the world*. My strategy in the following chapters is to describe and analyze a series of examples of acting with nature and the environment as a blueprint for the future. For the remainder of this chapter, I set out the basic perspective.

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What men want to learn from nature is how to use it in order wholly to dominate it and other men. —MAX HORKHEIMER AND THEODOR W. ADORNO, *Dialectic of Enlightenment*

"Acting with" is like "being nice" — it's hard to be against it but it doesn't mean much in itself. To put some flesh on the idea, we can start with the philosophical position known as dualism. Running from the Greeks through René Descartes to the present, this is the worldview that is central to Western modernity (Latour 1993). For our purposes, the duality in question is of people and things, the human and the nonhuman, understood to be different in kind. And this difference is usually understood asymmetrically, hierarchically. We humans have something special and exceptional — souls, reason, will — that sets us not just apart from the rest of creation but also above it, so to speak, in control. Dualism casts us as the only genuine agents in a passive and subservient world.

Dualism is what we implicitly teach our children in schools and universities when we teach them separately about the natural sciences (things) and the humanities and social sciences (people). And our made world echoes dualism back to us, filled with machines like cars and computers that usually obey our commands, slaves of their human masters. Dualism is our natural ontological attitude, one could say. And while dualism does not logically imply a stance of domination, the two fit together nicely: If we are the only genuine agents in the world, what else should we do but act on it and order it to serve us?

So, I want to say that domination as a pattern of *acting on* things, and indeed people, is a *dualist* way of going on. And the organizing question for this book is: what could a nondual way of going on look like? And how can we recognize it and emulate it when we see it?

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As a self-conscious philosophy, dualism went out of fashion long ago. It might be the natural ontological attitude of contemporary Western culture, but few academic philosophers would defend it today. And thinking about what is wrong with it will get us to *acting-with*. In the most general terms, what is wrong is simply that it is mistaken. Humanity is not, in fact, dualistically split off from the world. We are part of it. And many paths diverge at this point around the question of just how this "part of" is to be construed.[1] Here I will focus on my own way forward. In *The Mangle of Practice*, I developed a broadly pragmatist position which focused on *agency* — doing things, performance in the world — as constitutive of our being, and this emphasis on action and performance (rather than cognition) is central to my approach.[2] It brings out, first, a performative symmetry between the human and the nonhuman. We are certainly agents, we do consequential things in the world. But so are dogs and cats, stars and stones. And, second, beyond symmetry, the emphasis on agency brings out constitutive couplings across the dualist divide. The world responds to what we do to it and vice versa in a mutually transformative back-and-forth that I call, in a self-explanatory way, a *dance of agency* (Pickering 1995a).

Performance, agency, and the dance of agency are key concepts in all that follows. As just explained, they help map out a symmetric, nondualist worldview or ontology which, at the same time, denaturalizes domination and makes it problematic. A lively world does not need us to dominate and direct it and is quite capable of its own surprising performances (e.g., the recent coronavirus pandemic).

It is quite possible, then, to think our way out of dualism, but more needs to be said about patterns of action and about acting with, instead of on, the world. The first point to note is that while we are not, in fact, in charge of back-and-forth dances of agency with nature, we can act as if we are. In chapter 3, for example, we examine the attempts by the US Army Corps of Engineers (ACE) to dominate the Mississippi River and control its behavior. Of course, as we will also see, dances of agency never go away, but we could say that the ACE's actions veil or *background* the agency of the river. However the river replies to the ACE's initiatives, the ACE just plows on, trying to dictate terms to the river. In brief, then, this is how I want to think about dualist patterns of action: as backgrounding nonhuman agency, trying to ignore or suppress it, attempting to make the world dual. This is how I understand "acting on" the world.

And then, of course, a nondualist stance must entail something like *foregrounding* nonhuman agency, actively paying attention to what comes back to

us from the world and seeing how we might get along with that. In chapter 4, for example, we see how dam operators have tried to learn from the effects of artificial floods to restore the ecosystem of the Grand Canyon — going with the flow, nonduality in action. This is how I understand acting-with.

Where have we got to? I began from a concern with domination and alternatives to it. And now we have an idea of the contrast between a dualist stance of domination as our usual pattern of action and a nondualist stance of acting-with as a systematic alternative to that, in terms of whether we somehow background or foreground the agency of nature. What remains is to bring these abstract formulations to life by examining some examples, which is what the rest of the book does. I review a series of studies of nondualist action in our relations with nature and the environment, trying to emphasize how different they are from our customary ways of going on. The object in the end is to open up an awareness of the possibilities for nondualist acting-with across the board. By way of contrast, as I said, I also discuss, relatively briefly, parallel forms of dualism in action in order to emphasize the specificity of acting-with.[3]

The following chapters run through my examples; but before that, various general observations are worth putting on the table.

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1. *Words*. I am going to refer repeatedly to the two patterns of action just discussed — acting on and acting with — and it will help to have some more substantive adjectives and nouns to specify and distinguish them. I have thought about this a lot without arriving at any decisive solution. Dualist and nondualist is an obvious pairing, though not terribly evocative. Modern and nonmodern works (following Latour 1993). Human-centric or humanist versus decentered, posthuman. Martin Heidegger ([1954] 1977) called the dualist stance "enframing" — treating the world as "standing reserve" for human projects. His term for the other stance is "revealing," in the sense of "finding out" (e.g., finding out how a dance of agency will unfold) or "poiesis," the Greek word for "making" as "bringing forth." I will use all these words as appropriate but, carrying on from *The Cybernetic Brain*, mainly *enframing* for the stance of domination and *poiesis* for the nondualist alternative (pronounced, perhaps mistakenly, po-esis, with *poetic* as the adjective).[4] These terms seem richer and more substantive to me — the words themselves conjure up some of what is at stake in the different patterns of action that "dualist," "nonmodern," and so on do not. I know that *poiesis* is a strange word, but that is per-

haps appropriate for unfamiliar ways of acting. And to go back to the start, another way to catch the contrast in question, in a phrase rather than a word, is to think of enframing as *acting on* nature and poiesis as *acting with* nature.

2. *Paradigms*. Thomas Kuhn (1962) conceptualized major discontinuities in the history of science — scientific revolutions — as *gestalt switches*, in which aspects of the world that used to be in the foreground recede into the background and vice versa, bringing out new patterns. In just this sense, enframing and poiesis are different gestalts, different paradigms of thought and action, respectively backgrounding or foregrounding nonhuman agency. Kuhn argued that scientists act as if they live in different worlds before and after revolutions, and much the same is true of our examples of enframing and poiesis: poetic practices are strikingly different from their enframing counterparts.

3. *Emergence*. The poetic paradigm is decentered and posthuman, in the sense that poiesis evolves in the interplay of the human and the nonhuman with neither controlling the show. It is worth also emphasizing that this evolution is open-ended and *emergent*. The world can always surprise us. No one knows in advance how it will respond to our actions or vice versa. Dances of agency take shape in real time. Poiesis is thus an active and experimental process of *finding out* what will happen next. Again we can think here in terms of gestalts. Poiesis foregrounds emergence (as an integral aspect of agency), while enframing backgrounds it.

4. *Technology*. There is an important complication concerning both enframing and poiesis that needs attention. I have so far discussed both as *stances* in the world, dispositions to act in specific ways. The stance of enframing, say, means acting as if you are in charge, whatever comes along. The ACE's actions assume that the engineers can control the Mississippi even if they never quite succeed. But much of this book is concerned not so much with human action but with *technology* as a key interface with the world — so how should we think about that? I want to note that technologies, as well as stances, can be described as enframing or poetic, again precisely in the sense that they background or foreground the agency of their environments. In this respect, technologies are material proxies for human stances in the world.

Thus, most of the technologies that come immediately to mind — tools, machines, instruments — are technologies of enframing, designed to act on the world, to be *indifferent* to their surroundings, and *not* to engage in dances

of agency. My laptop does not care that today is the hottest day this year in Britain; it acts just the same as if I were sitting in the snow. It would be useless to me if its word-processing actions varied with the weather or the time of day. Heidegger's ([1954] 1977) most memorable example of a technology is a hydroelectric plant straddling the Rhine. The plant does one thing and one thing only, turning water flow into electricity, whatever the river does. It pins the river down, so to speak, making it appear as a power source. In later chapters we will need to think about levees, dams, sea walls, and the like — "hard defenses" against the environment. All these are designed to be indifferent to their surroundings, technologies of enframing that dominate water without responding to it at all. We could say that technologies of enframing are things we impose on the world as fixed solutions, ways of gaining our specified ends. If you want to control a river and generate electricity, build a dam.[5]

As far as poetic technologies are concerned, two somewhat different categories will show up below. First, at the opposite pole from enframing must be no technology. We will encounter several examples of giving up the fight with nature and *letting go*, including the removal of enframing technologies, as a positive and constructive strategy to let the agency of nature shine through — a response to iatrogenic problems called up by prior interventions.

But there is a more intricate class of poetic technologies also to be found in our examples, technologies that *respond* to their worlds by engaging with them in dances of agency — acting with them. My earlier book, *The Cybernetic Brain*, is about machines and devices that do just that. But in the present book it is often better to widen the sense of "technology" to something like "techniques" or even just "practices." The examples of poiesis in later chapters are largely techniques and practices that are coupled into and act with their objects in regularized *choreographies of agency*, such as patterns of dam operation geared to river flows that serve to stabilize a downstream ecosystem (chapter 4). These interest me a lot.

5. *Knowledge and action.*

Science and technology are blessed words in our contemporary vocabulary.
—LYNN WHITE JR., "The Historical Roots of Our Ecological Crisis"

"I would have thought the science was sacred to you."
"The science is of course sacred."
—EMILY MAITLIS AND BERNARD-HENRI LÉVY, *Newsnight*. BBC 2

The future of Britain will depend on a new age of invention and innovation. Technological superpowers such as the United States and China are investing heavily.... Britain must find its niche in this new world. To do so requires a radical new policy agenda, with science and technology at its core, that transcends the fray of 20th-century political ideology. —SIR TONY BLAIR AND WILLIAM HAGUE, Baron Hague of Richmond, *A New National Purpose: Innovation Can Power the Future of Britain*

What's so great about science? —PAUL FEYERABEND, *Science in a Free Society*

So far I have discussed poiesis and enframing in performative terms, as patterns of action with or on the world. Now we need to think about knowledge. In *The Mangle* I argued for what I called a performative epistemology, a view of knowledge as entangled with and transformed in worldly practices and performances, and we can consider that further here. At the most basic level, some sort of everyday, commonsense knowledge is entailed in all the examples to follow, functioning as a way of keeping track of dances of agency in poiesis, for example — this happened, then that happened, and so on. Here I am more concerned with more organized forms of knowledge, especially the different roles of science in enframing and poiesis.

A theme that runs through what follows is that, as Heidegger ([1954] 1977) argued, in many ways the sciences are complicit in and even integral to enframing. They set the world up for enframing in at least two senses. At the most basic level, sciences like physics and chemistry conjure up and describe a dualist cosmos in which things obey laws and regularities quite independently of us. As discussed already, this dualism feeds directly into enframing. More specifically, the sciences show us the levers of power — if we do *this*, the world will do *that* — necessary for us to achieve our ends. And what interests me most in this connection is that, in contrast, science is largely *absent* from our examples of poiesis. I will qualify this in a moment, but for now my point is that poesis is, in this sense, *doing without science*.[6]

One way to see this is to think about emergence. I said before that enframing backgrounds emergence while poiesis foregrounds it, and we should note that science can be key to this backgrounding. If we can *calculate* how some system (say, a river) will respond to our actions (building a dam) we don't need to struggle poetically through any dances of agency, we don't need to find anything out. In enframing, science thus functions as a shortcut to the future, a way of knowing in advance what will happen, a detour around emergence; while poiesis foregrounds not knowledge but a performative finding-out in practice.[7]

This version of the contrast between acting-with and acting-on, poiesis and enframing, is worth paying attention to. It helps foreground the strangeness and unfamiliarity of poiesis. We routinely think of science and technoscience more broadly as the key to our future, in terms of increasing productivity and even addressing all the problems of the Anthropocene, but that leaves us in the space of enframing and makes poiesis very difficult to recognize and think about. Poetic possibilities get obscured by the focus on science, and one aim of this book is therefore to bring them out of the shadows.

I should emphasize that my interest in this ascientific aspect of poiesis is not an argument that we should abandon or get rid of science. But writing this book has made me see the place of science in the world differently. On the one hand, I want to note that science is central to and bound up with enframing and that, on the other, more importantly here, there exists another pattern, poiesis, to which science is, as it happens, less important. We will see in the studies to follow that poiesis can be a successful pattern of, literally, doing (acting, performing) without (any appeal to) science. That this other ascientific and nonmodern paradigm can exist and be taken seriously here and now in the early days of the third millennium is perhaps the most striking idea of this book.

One way to bring home the significance of these observations is to think about education. We know very well how to teach our children science and the so-called STEM (Science, Technology, Engineering, and Mathematics) subjects as key elements of the enframing paradigm, but there is little if any space in the curriculum for teaching the key performative aspects of poiesis and acting-with. We could almost say that modern education is an indoctrination into enframing and leaves poiesis unimaginable. This is important and we can return to it in the final chapter.

Now I need to qualify these remarks in two ways. First, while science is indeed absent from most of my examples of poiesis, there is a significant scientific aspect to one of them, the adaptive management of the Colorado River (chapter 4). We can explore that further when we get there, but I can note now that in that instance, science appears in a different guise from the way we usually think about it. Instead of a definitive guide to the future and a shortcut around emergence, science appears there in a more modest role, as an aid to "seeing in the dark," so to speak, and a warning of unknowability—a tentative and revisable guide to what might happen if we act this way or that, and a way, again, of keeping track of what has happened. This connects

back to my interest in cybernetics and complexity science, to which we will later return.

Second, in a place analogous to science, various forms of Indigenous knowledge appear in chapters 7 and 8, on fire and spirits, respectively. I will not go into them in any detail, but I can mention here their nondualist aspect. Unlike modern scientific knowledge, they all foreground the agency of nature, they are guides to acting with the world rather than acting on it. They thus belong to the poetic rather than the enframing paradigm.

6. *Ontology*. The forms of knowledge just discussed are actively geared into practice. Both modern science and Indigenous knowledge help us see the future in courses of worldly action. But we could also think here about ontologies, overall visions of what the world is like, that implicitly inform and illuminate different patterns of practice, that are themselves proper to the enframing and poetic paradigms. Thus, I have already discussed how a dualist ontology which makes a clean and asymmetric split between people and things feeds into enframing as action (and vice versa). Likewise, the nondualist ontology I argued for in *The Mangle* hangs together with poiesis.

But my examples of poiesis invite some further ontological considerations. On the one hand, as I said before, cybernetics as a nonmodern science shares my mangle-ish ontology, and I find it interesting to explore ways in which specific resources from cybernetics illuminate the case studies of managing the Colorado River (chapter 4) and natural farming (chapter 6). Cybernetics does not help in seeing the future like the modern sciences; instead, it helps us get the hang of what is going on in maneuvers in fields of human and nonhuman agency and something of the strangeness of those maneuvers from a modern perspective.

In different ways, the studies also speak to other nonmodern ontological visions. In chapter 6, I argue that traditional Chinese concepts, specifically *shi* and *wu wei*, illuminate key aspects of natural farming (and thus our other studies, too), and that, conversely, the example of natural farming helps us grasp this unfamiliar non-Western ontology. Elsewhere, especially in the chapters on fire (chapter 7) and spirits (chapter 8), Native Australian and Amazonian animism appears, connecting back to the forms of Indigenous knowledge just mentioned. Again, animism is interesting in the present context as an ontology that foregrounds the agency of nature and our engagement with it. And if nothing else, animism, with its chancy gods and spirits, offers a warning about the possibility of technological failure.

7. So what?

As a source of life nature was venerated as sacred and human evolution was measured in terms of man's capacity to merge with her rhythms and patterns. —VANDANA SHIVA, *Staying Alive: Women, Ecology and Survival in India*

The fully enlightened earth radiates disaster triumphant. —MAX HORKHEIMER AND THEODOR W. ADORNO, *Dialectic of Enlightenment*

Enframing has brought us the immense power of modern technoscience. It *is* that immense power. So why bother ourselves about a different pattern of action, poiesis? For me, it began with a concern for the "political" implications of my ideas about agency and the mangle of practice — what sort of patterns of action do they point to? I find this question straightforwardly interesting, and the examples of poiesis that follow are the germ of an answer. From another angle, I have been using *poetic* as the adjectival form of *poiesis*, but it seems to me that there is also something poetic in an everyday sense and even graceful in the examples of poiesis in the following chapters. The opposite of *poetic* in this usage is something like *graceless*.[8] There is something graceless in drilling for oil a mile below the sea and hoping you can get away with it (Deepwater Horizon), as there is about enframing, mastery, slavery, and domination in general.

We can also think here about the perils of enframing — its dark side — and the corresponding promise of poiesis. Heidegger ([1954] 1977) described enframing as a "supreme danger" to humanity. On the one hand, he thought that enframing as a stance of mastery and domination distances and cuts us off from the world — nothing comes back from the slave to the master — and starves our inner being. We shrivel up inside.[9] Conversely, in foregrounding the nonhuman agency that enframing forgets, poiesis puts us in touch with the surprising powers of the world we live in and fosters intimate, sensitive, and responsive connections to it. This is the sense in which poiesis gets us closer to nature — performatively rather romantically.[10]

More concretely, in the wake of World War II, it was not hard for Heidegger to see technologies like gas chambers and atom bombs as horrifying exercises in enframing gone mad, to be avoided in the future at all costs. Seventy years or so later, as we travel deeper into the Anthropocene, the dark side of enframing is clearer. Emergence always bursts through somewhere. We have bent more and more of the world to our will but, as I said before, at the price of more and more — and bigger and bigger — unintended and unwanted "side effects": pollution, environmental disasters, global warming,

the mass extinction of species.[11] Enframing looks more brutal and dangerous every day, and this is certainly a reason to be interested in graceful and poetic alternatives. Poiesis is no magic bullet, but we can see in the following chapters how poetic approaches can help obviate or even avoid the dangers of enframing, and thus chip away at the Anthropocene from below — it offers another way to be.

To come at the *So what?* question more positively, I can note that there is general agreement that many real-world problems today concern so-called wicked systems, meaning systems that somehow resist scientific analysis, that science just bounces off, for some reason (Rittel and Webber 1973). The ecosystem of the Colorado River would be a nice example — too immensely complex for the effects of our interventions to be meaningfully calculated even if we knew all the equations, which we do not. Enframing is thus at most a blunt and rather dangerous instrument for tackling wicked systems and the wicked problems that surround us. And poiesis, in contrast, indeed offers a constructive approach when science fails — finding out about the world performatively, not cognitively, feeling our way forward in experimental dances of agency, as in the adaptive management of the Colorado ecosystem (chapter 4). It strikes me that this a very significant reason for being interested in poetic approaches across a very broad front.[12]

8. *Going back.*

These developments [climatic changes] are making it ever more evident that many "savage" and "brutish" people understood something about landscapes and the Earth that their conquerors did not. This, perhaps, is why even hardheaded, empirically minded foresters, water experts, and landscape engineers have begun to advocate policies based on Indigenous understandings of ecosystems. —AMITAV GHOSH, *The Nutmeg's Curse*

Far from an intransigent attachment to the past, ancestrality stems from a living memory that orients itself to the ability to envision a different future. —ARTURO ESCOBAR, "Sustaining the Pluriverse"

While writing this book, it has dawned on me that many of my examples in one way or another involve going back in time, restoring what has been lost or finding another way we used to do things. Initially, I found this surprising and almost regrettable, but in retrospect it seems obvious. If our dominant pattern of action today is dualistic mastery, one obvious source of inspiration must be in the nondualist past — nothing comes from nowhere. So here

I just want to emphasize that this was, for me, a discovery. I did not begin this book as a nostalgic trip down memory lane or from a conviction that everything used to be better.[13] Instead, I have found myself interested in specific patterns of action, some of which are rooted in the past, but which are practical and manifested in the present as seeds for the future. My conclusion is that — sometimes, and in specific ways — we need to rewind history in order to reopen paths not taken.[14]

Something similar can be said with respect to the nonmodern ontologies mentioned earlier. I discuss these nonmodern philosophies and spiritualities as appropriate because I am struck by the ways in which they speak directly to acting with nature. I feel again that such intersections help us both to get poiesis into focus and to foreground what is strange and unfamiliar about it. But I should emphasize again that these nonwestern worldviews do not come first in this book. I do not start from Daoism or animism and build a picture around that. You do not have to be an animist to follow the argument. My accounts center on maneuvers in fields of agency, and the point is that different modern and nonmodern philosophies resonate with them in different ways.

9. *Hybridity*. A technical point which complicates the story without changing the plot. I have written so far about acting-with and acting-on as if they can always be cleanly separated and distinguished, and the first point to make is that this split works here. I have chosen examples that bring out clearly the key features of poiesis, my main concern in the book — I want to get this unfamiliar pattern of acting into focus. And to bring out the contrast, I likewise emphasize clear examples of enframing. But there is more to be said.

Consider enframing as a stance. We typically do attempt to impose our plans on the world. We design dams, say, and go out and build them to that design. However, that in turn inevitably throws up problems in practice not anticipated in advance — how to cope with the unanticipated peculiarities of this particular construction site, and so on. And these peculiarities can often only be handled in an ad hoc, poetic fashion — finding out what works here and now. In this way enframing and poiesis are chained together, like yin and yang. But the point I need to stress is that this does not imply a symmetric relation between the two. The plan continues to structure the overall project, with poiesis filling the gaps. We can say that in general, enframing has a *fractal* structure in which poetic adjustments are parasitic on the overall trajectory of acting-on. Much the same can be said about enframing technologies. They often do succeed in dominating their worlds, but they degrade in use and require maintenance and servicing, which can again take a po-

etic form, but the acting-with here is also parasitic on acting-on. Once more, then, it seems appropriate to describe enframing as a practical gestalt that foregrounds mastery against a background of poiesis and findings-out.

Coming from the other direction, I can note that in my examples, poiesis is entwined with enframing. For instance, as acting-with, the adaptive management of the Colorado River (chapter 4), depends on the enframing structure of the Glen Canyon Dam to act on and modulate water flows and experimental floods. In fact, I find it impossible to imagine any poetic project or technique that does not also somehow entail fixed and reliable elements of mastery like that. But what interests me about projects like adaptive management is precisely that they foreground nonenframing aspects, the aspect of finding out what the river ecosystem will do and acting with that. This gets us back to the metaphor of practical gestalts: despite their hybridity, poetic practices and techniques lean on becoming and emergence, just as enframing leans on mastery.[15]

I have discussed acting-with and acting-on in terms of different ways of standing in the dance of agency, and we could think of my examples as limits at the ends of a spectrum. I think this is a good way to get poiesis, above all, into focus. It is no doubt the case that we could find intermediate examples in which the entwining of acting-with and acting-on is more evenly balanced and speaking of gestalts would find less purchase. But from the perspective of this book, such examples would serve only to muddy the waters, which is why I do not explore them further here.

10. *Scope*. It is easy to fall into a totalizing idiom and to write as if the pairing of poiesis and enframing can exhaust all possible patterns of action, but that is not my intention. Certainly, at an individual level many of our actions are oriented neither to domination nor finding out and experimentation. I should therefore simply note that my concern in this book is with organized and repeatable engagements with nature (flood defenses, farming, and so on) that, more or less explicitly, revolve around themes like controlling (though not necessarily dominating), managing, and generally getting along with the nonhuman world.

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This book is not written as an academic argument. One familiar tack would be to elaborate, say, the ontological discussion of the dance of agency, relate it positively or negatively to the thought of other philosophers and social sci-

entists, alive and dead, and so on — and thus to remain within the orbit of scholarly thought. I want to do something different. I want to conjure up and get clear on poiesis as an important but unfamiliar stance in the world, and the only way I know to do that is through examples — examples that tie the preceding remarks into the world — that show us what poiesis can look like in practice. The sequence of topics is as follows:

CHAPTER 1: Eels. This chapter tells a story of an invasive species, exemplifying a view of the world as centered on action and performance rather than words and ideas, and thus offering a model for thinking about the following chapters. Themes include human and nonhuman agency, the dance of agency, and the domination of nature. The story's generality is suggested by a comparison with the war on terror and responses to the coronavirus.

CHAPTER 2: The Mississippi. This chapter on flooding and river management exemplifies the same vision as chapter 1 but at a different scale. It discusses enframing as a particular stance in the flow of becoming, the relation between science and enframing, and connections between enframing and disaster. It touches for the first time on poiesis, which appears here as letting go.

CHAPTER 3: Erosion Control. Our first example of poiesis in action. This short chapter sketches out a simple model of poiesis to be elaborated in succeeding chapters. It emphasizes the efficacy of poiesis, and also the absence of science in this case.

CHAPTER 4: The Colorado. The focus is on the adapative management of the Colorado's ecosystem. Poiesis is examined here at greater length as a *process* of experimentation and adaptation, and as a *technique* in which the dance of agency becomes a choreography of agency. The chapter explores the contrast between poiesis and enframing, and the sense in which science is a fallible shortcut around poiesis. Two senses of "experiment" are distinguished — in the laboratory (science) and in the wild (poiesis). The chapter includes a discussion of scientific modeling, and of ways in which cybernetics illuminates key features of poiesis.

CHAPTER 5: Water. This chapter sketches out the long-term evolution of water management in the Netherlands, and a paradigm shift away from enframing and toward poetic approaches, with the Room for the River

project and rewilding as examples. Christian and animist ontologies are contrasted in relation to enframing and poiesis, respectively.

CHAPTER 6: Natural Farming. The focus here is on a distinctive approach to "natural farming" contrasted with conventional approaches. Poiesis is foregrounded again as both process and technique, leading to another choreography of agency. The critique of science from natural farming is explored, as is the relevance here of cybernetics and Daoism.

CHAPTER 7: A Choreography of Fire. This chapter discusses the Aboriginal choreography of fire in Australia as poiesis and creative management, contrasted with conventional fire-control techniques and scientific burning. It also notes the relation of Indigenous knowledge and animism to poiesis in this instance.

CHAPTER 8: Spirits. Amazonian shamanism is analyzed as a poetic technique, rejected by science. This chapter significantly broadens the frame of the analysis by engaging with non-standard forms of agency entangled with technologies of the self. A novel form of dualism — symmetric, not asymmetric — appears. This chapter engages with the ontological turn in anthropology and science and technology studies, and with the possibility of different scientific and non-scientific worlds.

CONCLUSION: Poiesis. This summarizes the book's argument and key concepts and clarifies some important points. The book ends with further discussion of the Anthropocene, the politics of poiesis, and the question of what education for poiesis rather than enframing might look like.

Notes

INTRODUCTION

Epigraph 1. Horkheimer and Adorno, *Dialectic of Enlightenment*, 4.

Epigraph 2. White, "The Historical Roots of Our Ecological Crisis," 155.

Epigraph 3. Maitlis and Lévy, *Newsnight*, BBC2.

Epigraph 4. Blair and Hague, *A New National Purpose: Innovation Can Power the Future of Britain*, 4.

Epigraph 5. Feyerabend, *Science in a Free Society*, 73.

Epigraph 6. Shiva, *Staying Alive*, 54.

Epigraph 7. Horkheimer and Adorno, *Dialectic of Enlightenment*, 3.

1 Here is a quick list of some leading ways of thinking our way out of dualism. Leveling-up: emphasizing that matter is more interesting and lively than dualism credits — for example, object-oriented philosophy and new materialism — on the latter, Coole and Frost (2010), Jane Bennett (2010) on "vibrant matter" and distributed agency. From a different angle, monism: philosophically, one can assert that humans are built from just the same stuff as the rest of the world, and that our apparently exceptional properties (like consciousness) are themselves emergent from matter. Or there is the "extended mind" thesis — the idea that our cognitive processes themselves run through and depend on noncognitive and nonhuman materials as "scaffolding" (Clark 2001; Hutchins 1995). Scott Gilbert (2023) offers a fascinating biological account of the sympoiesis of organisms and environments. The Copenhagen interpretation of quantum mechanics points to a coupling of subjects and objects that offers an opening for a more general nondualist ontology (Barad 2007). My approach here is closest to work by Donna Haraway (2003, 2004, 2008) and Anna Tsing (2012, 2015) in science and technology studies on human-nonhuman couplings and to the actor-network approach of Bruno Latour (1987, 1993), Michel Callon, John Law, and others. Adrian Franklin (2023a) collects a range of key essays from a generally STS

perspective. Another tactic is to invoke the sort of nondualist and Indigenous knowledges (Escobar 2017; Law 2015; de la Cadena and Blaser 2018; Viveiros de Castro 2012) discussed in various guises as this book goes on, including Daoism and animism.

2 Note that this sense of agency — as centered on action, shared with nonhumans — differs from a more usual exceptionalist sense which identifies agency with putatively unique characteristics of the human race like will and intention. For an extended discussion of the concept of agency as used in this book, see Pickering (2023). See also Plumwood (2001).

3 Authors who touch on alternative patterns of action along the lines suggested here would include Heidegger ([1954] 1977), the contributors to Pickering (2008), Lorimer (2017), Scott (1998, 2017, 2020), Haudricourt (1969), Cuntz (2014), Haraway (2003), Tsing (2012, 2015), Hinchliffe (2022), Puig de la Bellacasa (2019), Keulartz (2012), Escobar (2017), and the cyberneticians discussed in Pickering (2010).

4 In *The Cybernetic Brain* (2010), I tend to speak of "revealing" rather than "poiesis."

5 How to build objects that resist responding to their contexts is an interesting question. The simplest answer is to use materials that turn out to be stronger and more enduring than the objects to be acted upon: concrete, rock, metal, glass, silicon. Of course, all these react eventually to their contexts, usually by degrading gradually or catastrophically in use. A more interesting answer involves using negative feedback to create a disconnection. My laptop contains a fan which switches on if its temperature rises too far, extending the range of indifference. I thank Pablo Jensen for pointing this out to me.

6 "Science" is a word with many meanings. In reference to "doing without science," I have in mind the sort of familiar modern sciences such as physics that are generally considered exemplary of science, and which contribute to engineering, say, in a straightforward calculative fashion. In Pickering (2010) I argued that cybernetics, and the sciences of complexity more generally, belongs to a different, nonmodern, paradigm.

7 The above remarks apply to what one might call finished science or the finished products of science — bodies of knowledge, instruments, machines. These are the elements of science that belong to the world of enframing, that make the world knowable, calculable, and predictable. But if we look upstream from these products to scientific research or what Bruno Latour (1987) called science-in-the-making, a different picture emerges. Genuine scientific research more or less by definition, is poiesis: open-ended performative finding out — try it and see. As mentioned, I actually first arrived at the concept of a dance of agency in examining scientific research practice (Pickering 1993, 1995a). On the one hand, then, we have scientific research as poiesis; on the other, finished science as the handmaiden of enframing. The way to reconcile these is simply to recognize that the overall *aim*, the guiding telos, of scientific research, is to make the world dual — to produce an instrument that can perform indifferently to its surroundings in the mode of enframing, or a piece of dualistic knowledge that can

stand independently of its creator. In general, then, poiesis as research practice can, in fact, aim at and sometimes arrive at enframing as its technical product. The point to remember in the following chapters is therefore that in discussions of science and enframing we are concerned with finished science, not science-in-the-making.

8 Heidegger's word is "frenziedness." He speaks of "the frenziedness of ordering" and "the frenziedness of technology" ([1954] 1977, 236, 237). "Frenzy" is also Kopenawa's (Kopenawa and Albert 2013) word to characterize Westerners exploiting the Amazon (see chapter 8).

9 "I was shocked when . . . I saw the pictures of the earth taken from the moon. We do not need atomic bombs at all [to uproot us] — the uprooting of man is already here. All our relations have become merely technical ones" (Heidegger 1981, 59). The contrast with the many expressions of techno-optimism and planetary consciousness that usually go with pictures of the earth from space is striking.

10 Elsewhere, I discuss the way in which mainstream developments in information technology and artificial intelligence explicitly aim to disengage users from the world, with self-driving cars as an obvious example (Pickering 2019). Conversely, I also discuss the ways in which cybernetic technologies have aimed at engagement. On engagement and disengagement in our relations with animals, see Pickering (2021).

11 When I first wrote these sentences (August 18, 2020) much of Beirut had just been destroyed by the accidental explosion of an enormous quantity of ammonium nitrate (a fertilizer as well as an explosive).

12 Wicked systems are much the same as the "exceedingly complex systems" that Stafford Beer (1959, 18) defined as the subject matter of cybernetics. On wicked systems and the cybernetic method, see Pickering (forthcoming b).

13 For a sustained account of the technological value of traditional ecological knowledge, see Watson (2019).

14 I do not want to overemphasize this theme of going-back. It does not apply, for example, to my interest here in contemporary sciences of cybernetics and complexity.

15 Elsewhere, I explore the issue of ontological hybridity in more depth in the case of cybernetics (Pickering 2013a).

1. EELS: THE DANCE OF AGENCY

An earlier version of this chapter appeared as Pickering (2005a).

Epigraph 1. Acts of John, The Gnostic Society Library: 26.

1 In a fascinating discussion of ontological politics, C. Jensen (forthcoming) extends the themes of Pickering (2005a) to bring eel history up to date. It has to be said that his eels are not my eels: his focus is on European eels in the sea, not Asian ones in American waterways.