

Staying with
the Trouble
Making Kin *in the Chtulucene*

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CHAPTER 2

Tentacular Thinking

Anthropocene, Capitalocene, Chthulucene

We are all lichens.

—Scott Gilbert, “We Are All Lichens Now”

Think we must. We must think.

—Stengers and Despret, *Women Who Make a Fuss*

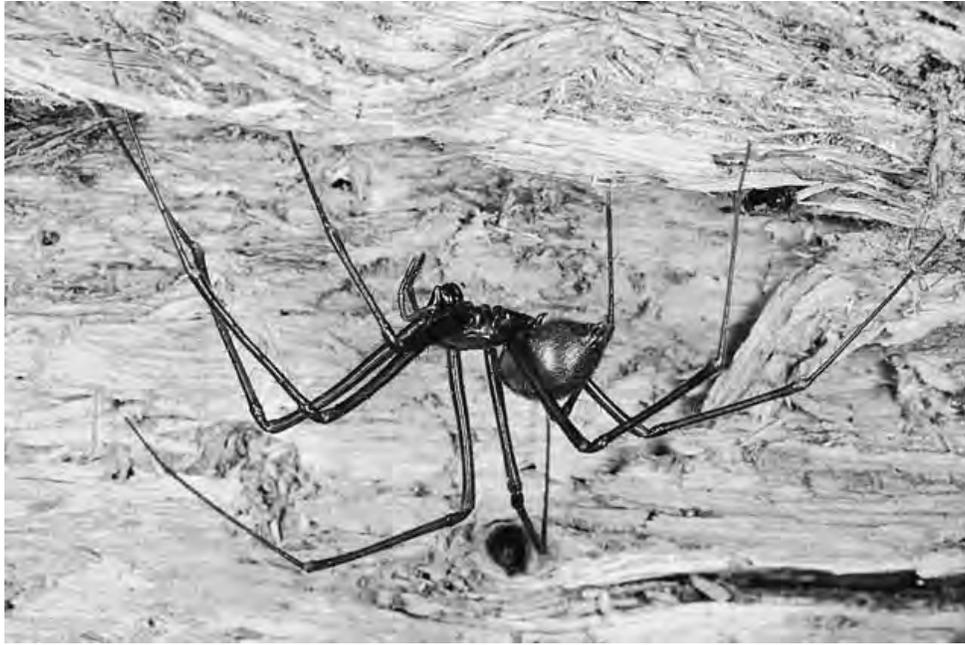
What happens when human exceptionalism and bounded individualism, those old saws of Western philosophy and political economics, become unthinkable in the best sciences, whether natural or social? Seriously unthinkable: not available to think with. Biological sciences have been especially potent in fermenting notions about all the mortal inhabitants of the earth since the imperializing eighteenth century. *Homo sapiens*—the Human as species, the Anthropos as the human species, Modern Man—was a chief product of these knowledge practices. What happens when the best biologies of the twenty-first century cannot do their job with bounded individuals plus contexts, when organisms plus environments, or genes plus whatever they need, no longer sustain the overflowing richness of biological knowledges, if they ever did? What happens when organisms plus environments can hardly be remembered for the same reasons that even Western-indebted people can no longer figure themselves as individuals and societies of individuals in human-

only histories? Surely such a transformative time on earth must not be named the Anthropocene!

In this chapter, with all the unfaithful offspring of the sky gods, with my littermates who find a rich wallow in multispecies muddles, I want to make a critical and joyful fuss about these matters. I want to stay with the trouble, and the only way I know to do that is in generative joy, terror, and collective thinking.

My first demon familiar in this task will be a spider, *Pimoides cthulhu*, who lives under stumps in the redwood forests of Sonoma and Mendocino Counties, near where I live in North Central California.¹ Nobody lives everywhere; everybody lives somewhere. Nothing is connected to everything; everything is connected to something.² This spider is in place, has a place, and yet is named for intriguing travels elsewhere. This spider will help me with returns, and with roots and routes.³ The eight-legged tentacular arachnid that I appeal to gets her generic name from the language of the Goshute people of Utah and her specific name from denizens of the depths, from the abyssal and elemental entities, called chthonic.⁴ The chthonic powers of Terra infuse its tissues everywhere, despite the civilizing efforts of the agents of sky gods to astralize them and set up chief Singletons and their tame committees of multiples or subgods, the One and the Many. Making a small change in the biologist's taxonomic spelling, from cthulhu to chthulu, with renamed *Pimoides chthulu* I propose a name for an elsewhere and elsewhere that was, still is, and might yet be: the Chthulucene. I remember that *tentacle* comes from the Latin *tentaculum*, meaning "feeler," and *tentare*, meaning "to feel" and "to try"; and I know that my leggy spider has many-armed allies. Myriad tentacles will be needed to tell the story of the Chthulucene.⁵

The tentacular ones tangle me in SF. Their many appendages make string figures; they entwine me in the poiesis—the making—of speculative fabulation, science fiction, science fact, speculative feminism, *soin de ficelle*, so far. The tentacular ones make attachments and detachments; they ake cuts and knots; they make a difference; they weave paths and consequences but not determinisms; they are both open and knotted in some ways and not others.⁶ SF is storytelling and fact telling; it is the patterning of possible worlds and possible times, material-semiotic worlds, gone, here, and yet to come. I work with string figures as a theoretical trope, a way to think-with a host of companions in sympoietic threading, felting, tangling, tracking, and sorting. I work with and in SF as material-semiotic composting, as theory in the mud, as muddle.⁷



2.1. *Pimosa cthulhu*. Photograph by Gustavo Hormiga.

The tentacular are not disembodied figures; they are cnidarians, spiders, finery beings like humans and raccoons, squid, jellyfish, neural extravaganzas, fibrous entities, flagellated beings, myofibril braids, matted and felted microbial and fungal tangles, probing creepers, swelling roots, reaching and climbing tendrilled ones. The tentacular are also nets and networks, IT critters, in and out of clouds. Tentacularity is about life lived along lines—and such a wealth of lines—not at points, not in spheres. “The inhabitants of the world, creatures of all kinds, human and non-human, are wayfarers”; generations are like “a series of inter-laced trails.”⁸ String figures all.

All the tentacular stringy ones have made me unhappy with post-humanism, even as I am nourished by much generative work done under that sign. My partner Rusten Hogness suggested compost instead of posthuman(ism), as well as humusities instead of humanities, and I jumped into that wormy pile.⁹ Human as humus has potential, if we could chop and shred human as Homo, the detumescing project of a self-making and planet-destroying CEO. Imagine a conference not on the Future of the Humanities in the Capitalist Restructuring University, but instead on the Power of the Humusities for a Habitable Multispecies Muddle! Ecosexual artists Beth Stephens and Annie Sprinkle made a bumper sticker for me, for us, for SF: “Composting is so hot!”¹⁰

The earth of the ongoing Chthulucene is sympoietic, not autopoietic. Mortal Worlds (Terra, Earth, Gaia, Chthulu, the myriad names and powers that are not Greek, Latin, or Indo-European at all)¹¹ do not make themselves, no matter how complex and multileveled the systems, no matter how much order out of disorder might be produced in generative autopoietic system breakdowns and relaunchings at higher levels of order. Autopoietic systems are hugely interesting—witness the history of cybernetics and information sciences; but they are not good models for living and dying worlds and their critters. Autopoietic systems are not closed, spherical, deterministic, or teleological; but they are not quite good enough models for the mortal SF world. Poiesis is symchthonic, sympoietic, always partnered all the way down, with no starting and subsequently interacting “units.”¹² The Chthulucene does not close in on itself; it does not round off; its contact zones are ubiquitous and continuously spin out loopy tendrils. Spider is a much better figure for sympoiesis than any inadequately leggy vertebrate of whatever pantheon. Tentacularity is symchthonic, wound with abyssal and dreadful graspings, frayings, and weavings, passing relays again and again, in the generative recursions that make up living and dying.

After I used the term *sympoiesis* in a grasp for something other than the lures of autopoiesis, Katie King told me about M. Beth Dempster’s Master of Environmental Studies thesis written in 1998, in which she suggested the term *sympoiesis* for “collectively-producing systems that do not have self-defined spatial or temporal boundaries. Information and control are distributed among components. The systems are evolutionary and have the potential for surprising change.” By contrast, autopoietic systems are “self-producing” autonomous units “with self defined spatial or temporal boundaries that tend to be centrally controlled, homeostatic, and predictable.”¹³ Dempster argued that many systems are mistaken for autopoietic that are really sympoietic. I think this point is important for thinking about rehabilitation (making livable again) and sustainability amid the porous tissues and open edges of damaged but still ongoing living worlds, like the planet earth and its denizens in current times being called the Anthropocene. If it is true that neither biology nor philosophy any longer supports the notion of independent organisms in environments, that is, interacting units plus contexts/rules, then sympoiesis is the name of the game in spades. Bounded (or neoliberal) individualism amended by autopoiesis is not good enough figurally or scientifically; it misleads us down deadly paths.

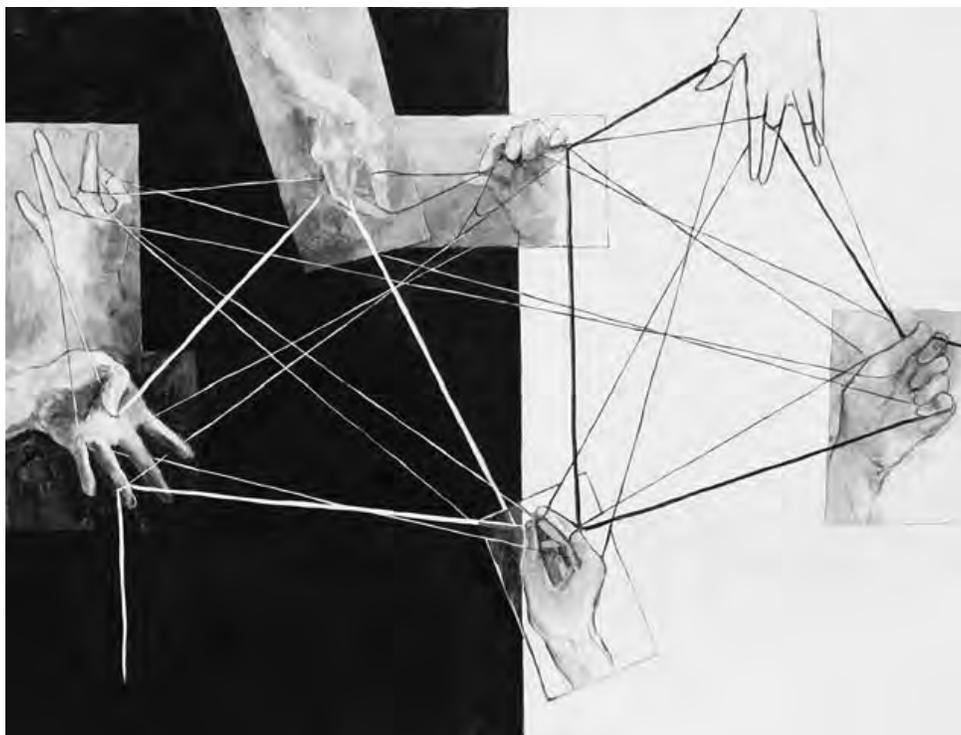
Barad's agential realism and intra-action become common sense, and perhaps a lifeline for Terran wayfarers.

SF, string figuring, is sympoietic. Thinking-with my work on cat's cradle, as well as with the work of another of her companions in thinking, Félix Guattari, Isabelle Stengers relayed back to me how players pass back and forth to each other the patterns-at-stake, sometimes conserving, sometimes proposing and inventing.

More precisely, com-menting, if it means thinking-with, that is becoming-with, is in itself a way of relaying . . . But knowing that what you take has been held out entails a particular thinking "between." It does not demand fidelity, still less fealty, rather a particular kind of loyalty, the answer to the trust of the held out hand. Even if this trust is not in "you" but in "creative uncertainty," even if the consequences and meaning of what has been done, thought or written, do not belong to you anymore than they belonged to the one you take the relay from, one way or another the relay is now in your hands, together with the demand that you do not proceed with "mechanical confidence." [In cat's cradling, at least] two pairs of hands are needed, and in each successive step, one is "passive," offering the result of its previous operation, a string entanglement, for the other to operate, only to become active again at the next step, when the other presents the new entanglement. But it can also be said that each time the "passive" pair is the one that holds, and is held by the entanglement, only to "let it go" when the other one takes the relay.¹⁴

In passion and action, detachment and attachment, this is what I call cultivating response-ability; that is also collective knowing and doing, an ecology of practices. Whether we asked for it or not, the pattern is in our hands. The answer to the trust of the held-out hand: think we must.

Marilyn Strathern is an ethnographer of thinking practices. She defines anthropology as studying relations with relations—a hugely consequential, mind- and body-altering sort of commitment.¹⁵ Nourished by her lifelong work in highland Papua New Guinea (Mt. Hagen), Strathern writes about accepting the risk of relentless contingency, of putting relations at risk with other relations, from unexpected worlds. Embodying the practice of feminist speculative fabulation in the scholarly mode, Strathern taught me—taught us—a simple but game-changing thing: "It matters what ideas we use to think other ideas."¹⁶ I compost my soul in this hot pile. The worms are not human; their undulating bodies in-



2.2. *Cat's Cradle / String Theory*, Baila Goldenthal, 2008. Oil on canvas, 36 × 48 in. Courtesy of Maurya Simon and Tamara Ambroson.

gest and reach, and their feces fertilize worlds. Their tentacles make string figures.

It matters what thoughts think thoughts. It matters what knowledges know knowledges. It matters what relations relate relations. It matters what worlds world worlds. It matters what stories tell stories. Paintings by Baila Goldenthal are eloquent testimony to this mattering.¹⁷

What is it to surrender the capacity to think? These times called the Anthropocene are times of multispecies, including human, urgency: of great mass death and extinction; of onrushing disasters, whose unpredictable specificities are foolishly taken as unknowability itself; of refusing to know and to cultivate the capacity of response-ability; of refusing to be present in and to onrushing catastrophe in time; of unprecedented looking away. Surely, to say “unprecedented” in view of the realities of the last centuries is to say something almost unimaginable. How can we think in times of urgencies *without* the self-indulgent and self-fulfilling myths of apocalypse, when every fiber of our being is interlaced, even complicit, in the webs of processes that must somehow be engaged and repatterned? Recursively, whether we asked for it or not, the pattern

is in our hands. The answer to the trust of the held-out hand: think we must.

Instructed by Valerie Hartouni, I turn to Hannah Arendt's analysis of the Nazi war criminal Adolf Eichmann's inability to think. In that surrender of thinking lay the "banality of evil" of the particular sort that could make the disaster of the Anthropocene, with its ramped-up genocides and speciescides, come true.¹⁸ This outcome is still at stake; think we must; we must think! In Hartouni's reading, Arendt insisted that thought was profoundly different from what we might call disciplinary knowledge or science rooted in evidence, or the sorting of truth and belief or fact and opinion or good and bad. Thinking, in Arendt's sense, is not a process for evaluating information and argument, for being right or wrong, for judging oneself or others to be in truth or error. All of that is important, but not what Arendt had to say about the evil of thoughtlessness that I want to bring into the question of the geohistorical conjuncture being called the Anthropocene.

Arendt witnessed in Eichmann not an incomprehensible monster, but something much more terrifying—she saw commonplace thoughtlessness. That is, here was a human being unable to make present to himself what was absent, what was not himself, what the world in its sheer not-one-selfness is and what claims-to-be inhere in not-oneself. Here was someone who could not be a wayfarer, could not entangle, could not track the lines of living and dying, could not cultivate response-ability, could not make present to itself what it is doing, could not live in consequences or with consequence, could not compost. Function mattered, duty mattered, but the world did not matter for Eichmann. The world does not matter in ordinary thoughtlessness. The hollowed-out spaces are all filled with assessing information, determining friends and enemies, and doing busy jobs; negativity, the hollowing out of such positivity, is missed, an astonishing abandonment of thinking.¹⁹ This quality was not an emotional lack, a lack of compassion, although surely that was true of Eichmann, but a deeper surrender to what I would call immateriality, inconsequentiality, or, in Arendt's and also my idiom, thoughtlessness. Eichmann was astralized right out of the muddle of thinking into the practice of business as usual no matter what. There was no way the world could become for Eichmann and his heirs—us?—a "matter of care."²⁰ The result was active participation in genocide.

The anthropologist, feminist, cultural theorist, storyteller, and connoisseur of the tissues of heterogeneous capitalism, globalism, travel-

ing worlds, and local places Anna Tsing examines the “arts of living on a damaged planet,”²¹ or, in the subtitle of her book, “the possibility of life in Capitalist ruins.” She performs thinking of a kind that must be cultivated in the all-too-ordinary urgencies of onrushing multispecies extinctions, genocides, immiserations, and exterminations. I name these things urgencies rather than emergencies because the latter word connotes something approaching apocalypse and its mythologies. Urgencies have other temporalities, and these times are ours. These are the times we must think; these are the times of urgencies that need stories.

Following matsutake mushrooms in their fulminating assemblages of Japanese, Americans, Chinese, Koreans, Hmong, Lao, Mexicans, fungal spores and mats, oak and pine trees, mycorrhizal symbioses, pickers, buyers, shippers, restaurateurs, diners, businessmen, scientists, foresters, DNA sequencers and their changing species, and much more, Tsing practices sympoietics in edgy times. Refusing either to look away or to reduce the earth’s urgency to an abstract system of causative destruction, such as a Human Species Act or undifferentiated Capitalism, Tsing argues that precarity—failure of the lying promises of Modern Progress—characterizes the lives and deaths of all terran critters in these times. She looks for the eruptions of unexpected liveliness and the contaminated and nondeterministic, unfinished, ongoing practices of living in the ruins. She performs the force of stories; she shows in the flesh how it matters which stories tell stories as a practice of caring and thinking. “If a rush of troubled stories is the best way to tell contaminated diversity, then it’s time to make that rush part of our knowledge practices . . . Matsutake’s willingness to emerge in blasted landscapes allows us to explore the ruins that have become our collective home. To follow matsutake guides us to possibilities of coexistence within environmental disturbance. This is not an excuse for further human damage. Still, matsutake show one kind of collaborative survival.”

Driven by radical curiosity, Tsing does the ethnography of “salvage accumulation” and “patchy capitalism,” the kind that can no longer promise progress but can and does extend devastation and make precarity the name of our systematicity. There is no simple ethical, political, or theoretical point to take from Tsing’s work; there is instead the force of engaging the world in the kind of thinking practices impossible for Eichmann’s heirs. “Matsutake tell us about surviving collaboratively in disturbance and contamination. We need this skill for living in ruins.”²² This is not a longing for salvation or some other sort of optimistic

politics; neither is it a cynical quietism in the face of the depth of the trouble. Rather, Tsing proposes a commitment to living and dying with response-ability in unexpected company. Such living and dying have the best chance of cultivating conditions for ongoingness.

The ecological philosopher and multispecies ethnographer Thom van Dooren also inhabits the layered complexities of living in times of extinction, extermination, and partial recuperation; he deepens our consideration of what thinking means, of what not becoming thoughtless exacts from all of us. In his extraordinary book *Flight Ways*, van Dooren accompanies situated bird species living on the extended edge of extinction, asking what it means to hold open space for another.²³ Such holding open is far from an innocent or obvious material or ethical practice; even when successful, it exacts tolls of suffering as well as surviving as individuals and as kinds. In his examination of the practices of the North American whooping crane species survival plan, for example, van Dooren details multiple kinds of hard multispecies captivities and labors, forced life, surrogate reproductive labor, and substitute dying—none of which should be forgotten, especially in successful projects. Holding open space might—or might not—delay extinction in ways that make possible composing or recomposing flourishing naturalcultural assemblages. *Flight Ways* shows how extinction is not a point, not a single event, but more like an extended edge or a widened ledge. Extinction is a protracted slow death that unravels great tissues of ways of going on in the world for many species, including historically situated people.²⁴

Van Dooren proposes that mourning is intrinsic to cultivating response-ability. In his chapter on conservation efforts for Hawaiian crows (‘Alalā for Hawaiians, *Corvus hawaiiensis* for Linneans), whose forest homes and foods as well as friends, chicks, and mates have largely disappeared, van Dooren argues that it is not just human people who mourn the loss of loved ones, of place, of lifeways; other beings mourn as well. Corvids grieve loss. The point rests on biobehavioral studies as well as intimate natural history; neither the capacity nor the practice of mourning is a human specialty. Outside the dubious privileges of human exceptionalism, thinking people must learn to grieve-with.

Mourning is about dwelling with a loss and so coming to appreciate what it means, how the world has changed, and how we must *ourselves* change and renew our relationships if we are to move forward from here. In this context, genuine mourning should open us into an aware-

ness of our dependence on and relationships with those countless others being driven over the edge of extinction . . . The reality, however, is that there *is* no avoiding the necessity of the difficult cultural work of reflection and mourning. This work is not opposed to practical action, rather it is the foundation of any sustainable and informed response.

Grief is a path to understanding entangled shared living and dying; human beings must grieve *with*, because we are in and of this fabric of undoing. Without sustained remembrance, we cannot learn to live with ghosts and so cannot think. Like the crows and with the crows, living and dead “we are at stake in each other’s company.”²⁵

At least one more SF thread is crucial to the practice of thinking, which must be thinking-with: storytelling. It matters what thoughts think thoughts; it matters what stories tell stories. “Urban Penguins: Stories for Lost Places,” van Dooren’s chapter on Sydney Harbor’s Little Penguins (*Eudyptula minor*), succeeds in crafting a nonanthropomorphic, nonanthropocentric sense of storied place. In their resolutely “philopatric” (home loving) nesting and other life practices, these urban penguins—real, particular birds—story place, *this* place, not just any place. Establishing the reality and vivid specificity of penguin-storied place is a major material-semiotic accomplishment. Storying cannot any longer be put into the box of human exceptionalism. Without deserting the terrain of behavioral ecology and natural history, this writing achieves powerful attunement to storying in penguin multimodal semiotics.²⁶

Ursula Le Guin taught me the carrier bag theory of storytelling and of naturalcultural history. Her theories, her stories, are capacious bags for collecting, carrying, and telling the stuff of living. “A leaf a gourd a shell a net a bag a sling a sack a bottle a pot a box a container. A holder. A recipient.”²⁷ So much of earth history has been told in the thrall of the fantasy of the first beautiful words and weapons, of the first beautiful weapons *as* words and vice versa. Tool, weapon, word: that is the word made flesh in the image of the sky god; that is the Anthropos. In a tragic story with only one real actor, one real world-maker, the hero, this is the Man-making tale of the hunter on a quest to kill and bring back the terrible bounty. This is the cutting, sharp, combative tale of action that defers the suffering of glutinous, earth-rotted passivity beyond bearing. All others in the prick tale are props, ground, plot space, or prey. They don’t matter; their job is to be in the way, to be overcome, to be the road, the conduit, but not the traveler, not the begetter. The last thing

the hero wants to know is that his beautiful words and weapons will be worthless without a bag, a container, a net.

Nonetheless, no adventurer should leave home without a sack. How did a sling, a pot, a bottle suddenly get in the story? How do such lowly things keep the story going? Or maybe even worse for the hero, how do those concave, hollowed-out things, those holes in Being, from the get-go generate richer, quirkier, fuller, unfitting, ongoing stories, stories with room for the hunter but which weren't and aren't about him, the self-making human, the human-making machine of history? The slight curve of the shell that holds just a little water, just a few seeds to give away and to receive, suggests stories of becoming-with, of reciprocal induction, of companion species whose job in living and dying is not to end the storying, the worlding. With a shell and a net, becoming human, becoming humus, becoming terran, has another shape—that is, the side-winding, snaky shape of becoming-with. To think-with is to stay with the naturalcultural multispecies trouble on earth. There are no guarantees, no arrow of time, no Law of History or Science or Nature in such struggles. There is only the relentlessly contingent SF worlding of living and dying, of becoming-with and unbecoming-with, of sympoiesis, and so, just possibly, of multispecies flourishing on earth.

Like Le Guin, Bruno Latour passionately understands the need to change the story, to learn somehow to narrate—to think—outside the prick tale of Humans in History, when the knowledge of how to murder each other—and along with each other, uncountable multitudes of the living earth—is not scarce. Think we must; we must think. That means, simply, we *must* change the story; the story *must* change. Le Guin writes, “Hence it is with a certain feeling of urgency that I seek the nature, subject, words of the other story, the untold one, the life story.”²⁸ In this terrible time called the Anthropocene, Latour argues that the fundamentals of geopolitics have been blasted open. None of the parties in crisis can call on Providence, History, Science, Progress, or any other god trick outside the common fray to resolve the troubles.²⁹ A common livable world must be composed, bit by bit, or not at all. What used to be called nature has erupted into ordinary human affairs, and vice versa, in such a way and with such permanence as to change fundamentally means and prospects for going on, including going on at all. Searching for compositionist practices capable of building effective new collectives, Latour argues that we must learn to tell “Gaïa stories.” If that word is too hard, then we can call our narrations “geostories,” in which “all the

former props and passive agents have become active without, for that, being part of a giant plot written by some overseeing entity.”³⁰ Those who tell Gaia stories or geostories are the “Earthbound,” those who eschew the dubious pleasures of transcendent plots of modernity and the purifying division of society and nature. Latour argues that we face a stark divide: “Some are readying themselves to live as Earthbound in the Anthropocene; others decided to remain as Humans in the Holocene.”³¹

In much of his writing, Latour develops the language and imagery of trials of strength; and in thinking about the Anthropocene and the Earthbound, he extends that metaphor to develop the difference between a police action, where peace is restored by an already existing order, and war or politics, where real enemies must be overcome to establish what will be. Latour is determined to avoid the idols of a ready-to-hand fix, such as Laws of History, Modernity, the State, God, Progress, Reason, Decadence, Nature, Technology, or Science, as well as the debilitating disrespect for difference and shared finitude inherent in those who already know the answers toward those who only need to learn them—by force, faith, or self-certain pedagogy. Those who “believe” they have the answers to the present urgencies are terribly dangerous. Those who refuse to be *for* some ways of living and dying and not others are equally dangerous. Matters of fact, matters of concern,³² and matters of care are knotted in string figures, in SF.

Latour embraces sciences, not Science. In geopolitics, “the important point here is to realize that the facts of the matter cannot be delegated to a higher unified authority that would have done the choice *in our stead*. Controversies—no matter how spurious they might be—are no excuse to delay the *decision* about which side represents our world *better*.”³³ Latour *aligns* himself with the reports of the Intergovernmental Panel on Climate Change (IPCC); he does not *believe* its assessments and reports; he *decides* what is strong and trustworthy and what is not. He casts his lot with some worlds and worldings and not others. One need not hear Latour’s “decision” discourse with an individualist ear; he is a compositionist intent on understanding how a common world, how collectives, are built-with each other, where all the builders are not human beings. This is neither relativism nor rationalism; it is SF, which Latour would call both sciences and scientifiction and I would call both sciences and speculative fabulation—all of which are political sciences, in our aligned approaches.

“Alignment” is a rich metaphor for wayfarers, for the Earthbound,

and does not as easily as “decision” carry the tones of modernist liberal choice discourse, at least in the United States. Further, the refusal of the modernist category of belief is also crucial to my effort to persuade us to take up the Chthulucene and its tentacular tasks.³⁴ Like Stengers and like myself, Latour is a thoroughgoing materialist committed to an ecology of practices, to the mundane articulating of assemblages through situated work and play in the muddle of messy living and dying. Actual players, articulating with varied allies of all ontological sorts (molecules, colleagues, and much more), must compose and sustain what is and will be. Alignment in tentacular worlding must be a seriously tangled affair!

Intent on the crucial refusal of self-certainty and preexisting god tricks, which I passionately share, Latour turns to a resource—relentless reliance on the material-semiotic trope of trials of strength—that, I think, makes it unnecessarily hard to tell his and our needed new story. He defines war as the absence of a referee so that trials of strength must determine the legitimate authority. Humans in History and the Earthbound in the Anthropocene are engaged in trials of strength where there is no Referee who/which can establish what is/was/will be. History versus Gaia stories are at stake. Those trials—the war of the Earthbound with the Humans—would not be conducted with rockets and bombs; they would be conducted with every other imaginable resource and with no god trick from above to decide life and death, truth and error. But still, we are in the story of the hero and the first beautiful words and weapons, not in the story of the carrier bag. Anything not decided in the presence of the Authority is war; Science (singular and capitalized) is the Authority; the Authority conducts police actions. In contrast, sciences (always rooted in practices) are war. Therefore, in Latour’s passionate speculative fabulation, such war is our only hope for real politics. The past is as much the contested zone as the present or future.

Latour’s thinking and stories need a specific kind of enemies. He draws on Carl Schmitt’s “political theology,” which is a theory of peace through war, with the enemy as *hostis*, with all its tones of host, hostage, guest, and worthy enemy. Only with such an enemy, Schmitt and Latour hold, is there respect and a chance to be less, not more, deadly in conflict. Those who operate within the categories of Authority and of belief are notoriously prone to exterminationist and genocidal combat (it’s hard to deny that!). They are lost without a pre-established Referee. The *hostis* demands much better. But all the action remains within the narrative vise of trials of strength, of mortal combat, within which

the knowledge of how to murder each other remains well entrenched. Latour makes clear that he does not *want* this story, but he does not propose another. The only real possibility for peace lies in the tale of the respected enemy, the *hostis*, and trials of strength. “But when you are at war, it is only through the throes of the encounters that the authority you have or don’t have will be decided *depending whether you win or lose*.”³⁵

Schmitt’s enemies do not allow the story to change in its marrow; the Earthbound need a more tentacular, less binary life story. Latour’s Gaia stories deserve better companions in storytelling than Schmitt. The question of whom to think-with is immensely material. I do not think Latour’s dilemma can be resolved in the terms of the Anthropocene. His Earthbound will have to trek into the Chthulucene to entangle with the ongoing, snaky, unheroic, tentacular, dreadful ones, the ones which/who craft material-semiotic netbags of little use in trials of strength but of great use in bringing home and sharing the means of living and dying well, perhaps even the means of ecological recuperation for human and more-than-human critters alike.

Shaping her thinking about the times called Anthropocene and “multi-faced Gaïa” (Stengers’s term) in companionable friction with Latour, Isabelle Stengers does not ask that we recompose ourselves to become able, perhaps, to “face Gaïa.” But like Latour and even more like Le Guin, one of her most generative SF writers, Stengers is adamant about changing the story. Focusing on intrusion rather than composition, Stengers calls Gaia a fearful and devastating power that intrudes on our categories of thought, that intrudes on thinking itself.³⁶ Earth/Gaia is maker and destroyer, not resource to be exploited or ward to be protected or nursing mother promising nourishment. Gaia is not a person but complex systemic phenomena that compose a living planet. Gaia’s intrusion into our affairs is a radically materialist event that collects up multitudes. This intrusion threatens not life on earth itself—microbes will adapt, to put it mildly—but threatens the livability of earth for vast kinds, species, assemblages, and individuals in an “event” already under way called the Sixth Great Extinction.³⁷

Stengers, like Latour, evokes the name of Gaia in the way James Lovelock and Lynn Margulis did, to name complex nonlinear couplings between processes that compose and sustain entwined but nonadditive subsystems as a partially cohering systemic whole.³⁸ In this hypothesis, Gaia is autopoietic—self-forming, boundary maintaining, contingent,

dynamic, and stable under some conditions but not others. Gaia is not reducible to the sum of its parts, but achieves finite systemic coherence in the face of perturbations within parameters that are themselves responsive to dynamic systemic processes. Gaia does not and could not care about human or other biological beings' intentions or desires or needs, but Gaia puts into question our very existence, we who have provoked its brutal mutation that threatens both human and nonhuman livable presents and futures. Gaia is not about a list of questions waiting for rational policies;³⁹ Gaia is an intrusive event that undoes thinking as usual. "She is what specifically questions the tales and refrains of modern history. There is only one real mystery at stake, here: it is the answer we, meaning those who belong to this history, may be able to create as we face the consequences of what we have provoked."⁴⁰

Anthropocene

So, what have we provoked? Writing in the midst of California's historic multiyear drought and the explosive fire season of 2015, I need the photograph of a fire set deliberately in June 2009 by Sustainable Resource Alberta near the Saskatchewan River Crossing on the Icefields Parkway in order to stem the spread of mountain pine beetles, to create a fire barrier to future fires, and to enhance biodiversity. The hope is that this fire acts as an ally for resurgence. The devastating spread of the pine beetle across the North American West is a major chapter of climate change in the Anthropocene. So too are the predicted megadroughts and the extreme and extended fire seasons. Fire in the North American West has a complicated multispecies history; fire is an essential element for ongoing, as well as an agent of double death, the killing of ongoingness. The material semiotics of fire in our times are at stake.

Thus it is past time to turn directly to the time-space-global thing called Anthropocene.⁴¹ The term seems to have been coined in the early 1980s by University of Michigan ecologist Eugene Stoermer (d. 2012), an expert in freshwater diatoms. He introduced the term to refer to growing evidence for the transformative effects of human activities on the earth. The name Anthropocene made a dramatic star appearance in globalizing discourses in 2000 when the Dutch Nobel Prize-winning atmospheric chemist Paul Crutzen joined Stoermer to propose that human activities had been of such a kind and magnitude as to merit the use of a new geological term for a new epoch, superseding the Holocene,



2.3. Icon for the Anthropocene: Flaming Forests. From Rocky Mountain House, Alberta, Canada, June 2, 2009. Photograph by Cameron Strandberg.

which dated from the end of the last ice age, or the end of the Pleistocene, about twelve thousand years ago. Anthropogenic changes signaled by the mid-eighteenth-century steam engine and the planet-changing exploding use of coal were evident in the airs, waters, and rocks.⁴² Evidence was mounting that the acidification and warming of the oceans are rapidly decomposing coral reef ecosystems, resulting in huge ghostly white skeletons of bleached and dead or dying coral. That a symbiotic system—coral, with its watery world-making associations of cnidarians and zooanthellae with many other critters too—indicated such a global transformation will come back into our story.

But for now, notice that the Anthropocene obtained purchase in popular and scientific discourse in the context of ubiquitous urgent efforts to find ways of talking about, theorizing, modeling, and managing a Big Thing called Globalization. Climate-change modeling is a powerful positive feedback loop provoking change-of-state in systems of political and ecological discourses.⁴³ That Paul Crutzen was both a Nobel laureate and an atmospheric chemist mattered. By 2008, many scientists around the world had adopted the not-yet-official but increasingly indispensable term;⁴⁴ and myriad research projects, performances, installations, and conferences in the arts, social sciences, and humanities found the

term mandatory in their naming and thinking, not least for facing both accelerating extinctions across all biological taxa and also multispecies, including human, immiseration across the expanse of Terra. Fossil-burning human beings seem intent on making as many new fossils as possible as fast as possible. They will be read in the strata of the rocks on the land and under the waters by the geologists of the very near future, if not already. Perhaps, instead of the fiery forest, the icon for the Anthropocene should be Burning Man!⁴⁵

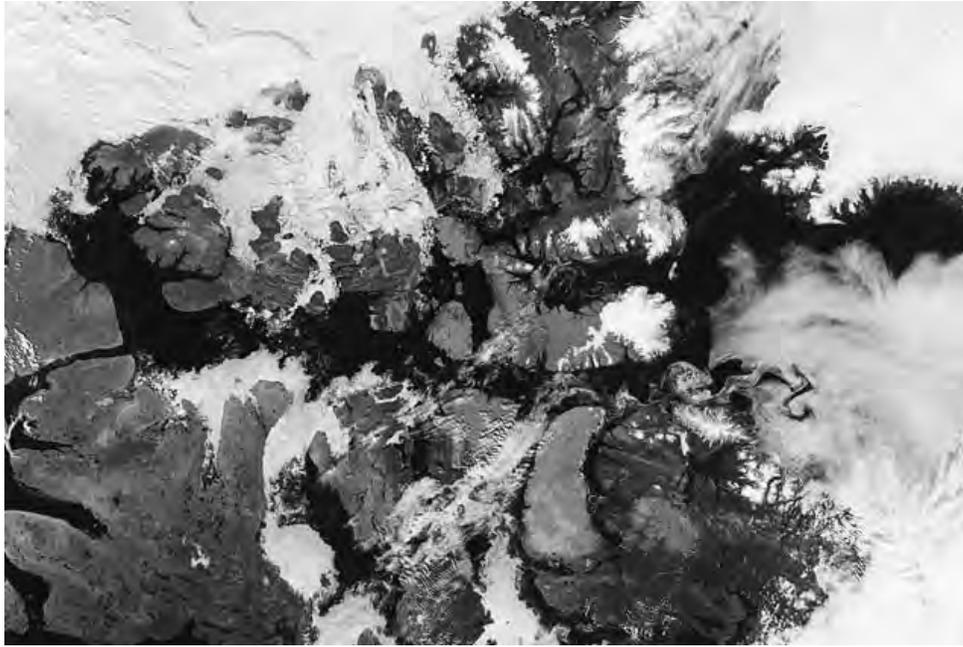
The scale of burning ambitions of fossil-making man—of this Anthropos whose hot projects for accelerating extinctions merits a name for a geological epoch—is hard to comprehend. Leaving aside all the other accelerating extractions of minerals, plant and animal flesh, human homelands, and so on, surely, we want to say, the pace of development of renewable energy technologies and of political and technical carbon pollution-abatement measures, in the face of palpable and costly ecosystem collapses and spreading political disorders, will mitigate, if not eliminate, the burden of planet-warming excess carbon from burning still more fossil fuels. Or, maybe the financial troubles of the global coal and oil industries by 2015 would stop the madness. Not so. Even casual acquaintance with the daily news erodes such hopes, but the trouble is worse than what even a close reader of IPCC documents and the press will find. In “The Third Carbon Age,” Michael Klare, a professor of Peace and World Security Studies at Hampshire College, lays out strong evidence against the idea that the old age of coal, replaced by the recent age of oil, will be replaced by the age of renewables.⁴⁶ He details the large and growing global national and corporate investments in renewables; clearly, there are big profit and power advantages to be had in this sector. And at the same time, every imaginable, and many unimaginable, technologies and strategic measures are being pursued by all the big global players to extract every last calorie of fossil carbon, at whatever depth and in whatever formations of sand, mud, or rock, and with whatever horrors of travel to distribution and use points, to burn before someone else gets at that calorie and burns it first in the great prick story of the first and the last beautiful words and weapons.⁴⁷ In what he calls the Age of Unconventional Oil and Gas, hydro-fracking is the tip of the (melting) iceberg. Melting of the polar seas, terrible for polar bears and for coastal peoples, is very good for big competitive military, exploration, drilling, and tanker shipping across the northern passages. Who needs an icebreaker when you can count on melting ice?⁴⁸

A complex systems engineer named Brad Werner addressed a session at the meetings of the American Geophysical Union in San Francisco in 2012. His point was quite simple: scientifically speaking, global capitalism “has made the depletion of resources so rapid, convenient and barrier-free that ‘earth-human systems’ are becoming dangerously unstable in response.” Therefore, he argued, the only scientific thing to do is revolt! Movements, not just individuals, are critical. What is required is action and thinking that do not fit within the dominant capitalist culture; and, said Werner, this is a matter not of opinion, but of geophysical dynamics. The reporter who covered this session summed up Werner’s address: “He is saying that his research shows that our entire economic paradigm is a threat to ecological stability.”⁴⁹ Werner is not the first or the last researcher and maker of matters of concern to argue this point, but his clarity at a scientific meeting is bracing. Revolt! Think we must; we must think. Actually think, not like Eichmann the Thoughtless. Of course, the devil is in the details—how to revolt? How to matter and not just want to matter?

Capitalocene

But at least one thing is crystal clear. No matter how much he might be caught in the generic masculine universal and how much he only looks up, the Anthropos did not do this fracking thing and he should not name this double-death-loving epoch. The Anthropos is not Burning Man after all. But because the word is already well entrenched and seems less controversial to many important players compared to the Capitalocene, I know that we will continue to need the term *Anthropocene*. I will use it too, sparingly; what and whom the Anthropocene collects in its refurbished netbag might prove potent for living in the ruins and even for modest terran recuperation.

Still, if we could only have one word for these SF times, surely it must be the Capitalocene.⁵⁰ Species Man did not shape the conditions for the Third Carbon Age or the Nuclear Age. The story of Species Man as the agent of the Anthropocene is an almost laughable rerun of the great phallic humanizing and modernizing Adventure, where man, made in the image of a vanished god, takes on superpowers in his secular-sacred ascent, only to end in tragic detumescence, once again. Autopoietic, self-making man came down once again, this time in tragic system failure, turning biodiverse ecosystems into flipped-out deserts of slimy mats



2.4. Icon for the Capitalocene: Sea Ice Clearing from the Northwest Passage, Data 2012. NASA Visible Earth image by Jesse Allen, 2015, using data from the Land Atmosphere Near Real-Time Capability for EOS (LANCE). National Snow and Ice Data Center.

and stinging jellyfish. Neither did technological determinism produce the Third Carbon Age. Coal and the steam engine did not determine the story, and besides the dates are all wrong, not because one has to go back to the last ice age, but because one has to at least include the great market and commodity reworldings of the long sixteenth and seventeenth centuries of the current era, even if we think (wrongly) that we can remain Euro-centered in thinking about “globalizing” transformations shaping the Capitalocene.⁵¹ One must surely tell of the networks of sugar, precious metals, plantations, indigenous genocides, and slavery, with their labor innovations and relocations and recompositions of critters and things sweeping up both human and nonhuman workers of all kinds. The infectious industrial revolution of England mattered hugely, but it is only one player in planet-transforming, historically situated, new enough, worlding relations. The relocation of peoples, plants, and animals; the leveling of vast forests; and the violent mining of metals preceded the steam engine; but that is not a warrant for wringing one’s hands about the perfidy of the Anthropos, or of Species Man, or of Man the Hunter.

The systemic stories of the linked metabolisms, articulations, or coproductions (pick your metaphor) of economies and ecologies, of histories and human and nonhuman critters, must be relentlessly opportunistic and contingent. They must also be relentlessly relational, sympoietic, and consequential.⁵² They are terran, not cosmic or blisped or cursed into outer space. The Capitalocene is terran; it does not have to be the last biodiverse geological epoch that includes our species too. There are so many good stories yet to tell, so many netbags yet to string, and not just by human beings.

As a provocation, let me summarize my objections to the Anthropocene as a tool, story, or epoch to think with: (1) The myth system associated with the Anthropos is a setup, and the stories end badly. More to the point, they end in double death; they are not about ongoingness. It is hard to tell a good story with such a bad actor. Bad actors need a story, but not the whole story. (2) Species Man does not make history. (3) Man plus Tool does not make history. That is the story of History human exceptionalists tell. (4) That History must give way to geostories, to Gaia stories, to symchthonic stories; terrans do webbed, braided, and tentacular living and dying in sympoietic multispecies string figures; they do not do History. (5) The human social apparatus of the Anthropocene tends to be top-heavy and bureaucracy prone. Revolt needs other forms of action and other stories for solace, inspiration, and effectiveness. (6) Despite its reliance on agile computer modeling and autopoietic systems theories, the Anthropocene relies too much on what should be an “un-thinkable” theory of relations, namely the old one of bounded utilitarian individualism—preexisting units in competition relations that take up all the air in the atmosphere (except, apparently, carbon dioxide). (7) The sciences of the Anthropocene are too much contained within restrictive systems theories and within evolutionary theories called the Modern Synthesis, which for all their extraordinary importance have proven unable to think well about sympoiesis, symbiosis, symbiogenesis, development, webbed ecologies, and microbes. That’s a lot of trouble for adequate evolutionary theory. (8) Anthropocene is a term most easily meaningful and usable by intellectuals in wealthy classes and regions; it is not an idiomatic term for climate, weather, land, care of country, or much else in great swathes of the world, especially but not only among indigenous peoples.

I am aligned with feminist environmentalist Eileen Crist when she writes against the managerial, technocratic, market-and-profit besotted,

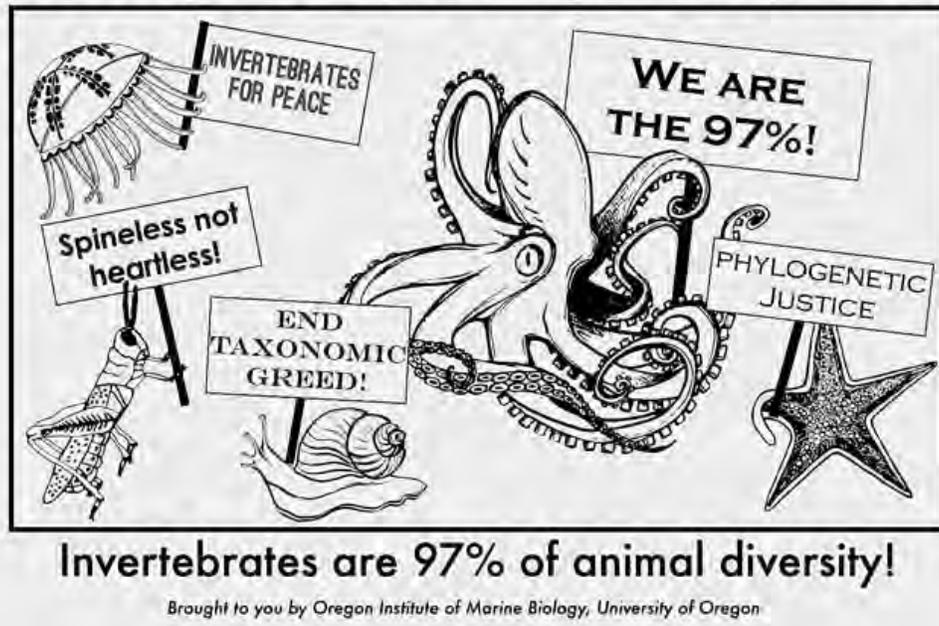
modernizing, and human-exceptionalist business-as-usual commitments of so much Anthropocene discourse. This discourse is not simply wrong-headed and wrong-hearted in itself; it also saps our capacity for imagining and caring for other worlds, both those that exist precariously now (including those called wilderness, for all the contaminated history of that term in racist settler colonialism) and those we need to bring into being in alliance with other critters, for still possible recuperating pasts, presents, and futures. “Scarcity’s deepening persistence, and the suffering it is auguring for all life, is an artifact of human exceptionalism at every level.” Instead, a humanity with more earthly integrity “invites the *priority* of our pulling back and scaling down, of welcoming limitations of our numbers, economies, and habitats for the sake of a higher, more inclusive freedom and quality of life.”⁵³

If Humans live in History and the Earthbound take up their task within the Anthropocene, too many Posthumans (and posthumanists, another gathering altogether) seem to have emigrated to the Anthropocene for my taste. Perhaps my human and nonhuman people are the dreadful Chthonic ones who snake within the tissues of Terrapolis.

Note that insofar as the Capitalocene is told in the idiom of fundamentalist Marxism, with all its trappings of Modernity, Progress, and History, that term is subject to the same or fiercer criticisms. The stories of both the Anthropocene and the Capitalocene teeter constantly on the brink of becoming much Too Big. Marx did better than that, as did Darwin. We can inherit their bravery and capacity to tell big-enough stories without determinism, teleology, and plan.⁵⁴

Historically situated relational worldings make a mockery both of the binary division of nature and society and of our enslavement to Progress and its evil twin, Modernization. The Capitalocene was relationally made, and not by a secular godlike anthropos, a law of history, the machine itself, or a demon called Modernity. The Capitalocene must be relationally unmade in order to compose in material-semiotic SF patterns and stories something more livable, something Ursula K. Le Guin could be proud of. Shocked anew by our—billions of earth habitant’s, including your and my—ongoing daily assent in practice to this thing called capitalism, Philippe Pignarre and Isabelle Stengers note that denunciation has been singularly ineffective, or capitalism would have long ago vanished from the earth. A dark bewitched commitment to the lure of Progress (and its polar opposite) lashes us to endless infernal alternatives, as if we had no other ways to reworld, reimagine, relive, and

OCTOPI WALL STREET



2.5. *Octopi Wall Street*: Symchthonic revolt. Art by Marley Jarvis, Laurel Hiebert, Kira Treibergs, 2011. Oregon Institute of Marine Biology.

reconnect with each other, in multispecies well-being. This explication does not excuse us from doing many important things better; quite the opposite. Pignarre and Stengers affirm on-the-ground collectives capable of inventing new practices of imagination, resistance, revolt, repair, and mourning, and of living and dying well. They remind us that the established disorder is not necessary; another world is not only urgently needed, it is possible, but not if we are ensorcelled in despair, cynicism, or optimism, and the belief/disbelief discourse of Progress.⁵⁵ Many Marxist critical and cultural theorists, at their best, would agree.⁵⁶ So would the tentacular ones.⁵⁷

Chthulucene

Reaching back to generative complex systems approaches by Lovelock and Margulis, Gaia figures the Anthropocene for many contemporary Western thinkers. But an unfurling Gaia is better situated in the Chthulucene, an ongoing temporality that resists figuration and dating and demands myriad names. Arising from Chaos,⁵⁸ Gaia was and is a power-

ful intrusive force, in no one's pocket, no one's hope for salvation, capable of provoking the late twentieth century's best autopoietic complex systems thinking that led to recognizing the devastation caused by anthropogenic processes of the last few centuries, a necessary counter to the Euclidean figures and stories of Man.⁵⁹ Brazilian anthropologists and philosophers Eduardo Viveiros de Castro and Déborah Danowski exorcise lingering notions that Gaia is confined to the ancient Greeks and subsequent Eurocultures in their refiguring the urgencies of our times in the post-Eurocentric conference "The Thousand Names of Gaia."⁶⁰ Names, not faces, not morphs of the same, something else, a thousand somethings else, still telling of linked ongoing generative and destructive worlding and reworlding in this age of the earth. We need another figure, a thousand names of something else, to erupt out of the Anthropocene into another, big-enough story. Bitten in a California redwood forest by spidery *Pimoides chthulhu*, I want to propose snaky Medusa and the many unfinished worldings of her antecedents, affiliates, and descendants. Perhaps Medusa, the only mortal Gorgon, can bring us into the holobiomes of Terrapolis and heighten our chances for dashing the twenty-first-century ships of the Heroes on a living coral reef instead of allowing them to suck the last drop of fossil flesh out of dead rock.

The terra-cotta figure of Potnia Theron, the Mistress of the Animals, depicts a winged goddess wearing a split skirt and touching a bird with each hand.⁶¹ She is a vivid reminder of the breadth, width, and temporal reach into pasts and futures of chthonic powers in Mediterranean and Near Eastern worlds and beyond.⁶² Potnia Theron is rooted in Minoan and then Mycenaean cultures and infuses Greek stories of the Gorgons (especially the only mortal Gorgon, Medusa) and of Artemis. A kind of far-traveling Ur-Medusa, the Lady of the Beasts is a potent link between Crete and India. The winged figure is also called Potnia Melissa, Mistress of the Bees, draped with all their buzzing-stinging-honeyed gifts. Note the acoustic, tactile, and gustatory senses elicited by the Mistress and her sympoietic, more-than-human flesh. The snakes and bees are more like stinging tentacular feelers than like binocular eyes, although these critters see too, in compound-eyed insectile and many-armed optics.

In many incarnations around the world, the winged bee goddesses are very old, and they are much needed now.⁶³ Potnia Theron/Melissa's snaky locks and Gorgon face tangle her with a diverse kinship of chthonic earthly forces that travel richly in space and time. The Greek word Gorgon translates as dreadful, but perhaps that is an astralized, patriarchal hear-



2.6. Icon for the Chthulucene. Potnia Theron with a Gorgon Face. Type of Potnia Theron, Kameiros, Rhodes, circa 600 BCE, terracotta, 13 in. diameter, British Museum, excavated by Auguste Salzmann and Sir Alfred Bilotti; purchased 1860. Photograph by Marie-Lan Nguyen, © 2007.

ing of much more awe-ful stories and enactments of generation, destruction, and tenacious, ongoing terran finitude. Potnia Theron/Melissa/Medusa give faciality a profound makeover, and that is a blow to modern humanist (including technohumanist) figurations of the forward-looking, sky-gazing Anthropos. Recall that the Greek *chthonios* means “of, in, or under the earth and the seas”—a rich terran muddle for SF, science fact, science fiction, speculative feminism, and speculative fabulation. The chthonic ones are precisely not sky gods, not a foundation for the Olympiad, not friends to the Anthropocene or Capitalocene, and definitely not finished. The Earthbound can take heart—as well as action.

The Gorgons are powerful winged chthonic entities without a proper genealogy; their reach is lateral and tentacular; they have no settled lineage and no reliable kind (genre, gender), although they are figured and

storied as female. In old versions, the Gorgons twine with the Erinyes (Furies), chthonic underworld powers who avenge crimes against the natural order. In the winged domains, the bird-bodied Harpies carry out these vital functions.⁶⁴ Now, look again at the birds of Potnia Theron and ask what they do. Are the Harpies their cousins? Around 700 BCE Hesiod imagined the Gorgons as sea demons and gave them sea deities for parents. I read Hesiod's *Theogony* as laboring to stabilize a very bumptious queer family. The Gorgons erupt more than emerge; they are intrusive in a sense akin to what Stengers understands by Gaia.

The Gorgons turned men who looked into their living, venomous, snake-encrusted faces into stone. I wonder what might have happened if those men had known how to politely greet the dreadful chthonic ones. I wonder if such manners can still be learned, if there is time to learn now, or if the stratigraphy of the rocks will only register the ends and end of a stony Anthropos.⁶⁵

Because the deities of the Olympiad identified her as a particularly dangerous enemy to the sky gods' succession and authority, mortal Medusa is especially interesting for my efforts to propose the Chthulucene as one of the big-enough stories in the netbag for staying with the trouble of our ongoing epoch. I resignify and twist the stories, but no more than the Greeks themselves constantly did.⁶⁶ The hero Perseus was dispatched to kill Medusa; and with the help of Athena, head-born favorite daughter of Zeus, he cut off the Gorgon's head and gave it to his accomplice, this virgin goddess of wisdom and war. Putting Medusa's severed head face-forward on her shield, the Aegis, Athena, as usual, played traitor to the Earthbound; we expect no better from motherless mind children. But great good came of this murder-for-hire, for from Medusa's dead body came the winged horse Pegasus. Feminists have a special friendship with horses. Who says these stories do not still move us materially?⁶⁷ And from the blood dripping from Medusa's severed head came the rocky corals of the western seas, remembered today in the taxonomic names of the Gorgonians, the coral-like sea fans and sea whips, composed in symbioses of tentacular animal cnidarians and photosynthetic algal-like beings called zooanthellae.⁶⁸

With the corals, we turn definitively away from heady facial representations, no matter how snaky. Even Potnia Theron, Potnia Melissa, and Medusa cannot alone spin out the needed tentacularities. In the tasks of thinking, figuring, and storytelling, the spider of my first pages, *Pimoid chthulhu*, allies with the decidedly nonvertebrate critters of the

seas. Corals align with octopuses, squids, and cuttlefish. Octopuses are called spiders of the seas, not only for their tentacularity, but also for their predatory habits. The tentacular chthonic ones have to eat; they are at table, *cum panis*, companion species of terra. They are good figures for the luring, beckoning, gorgeous, finite, dangerous precariousities of the Chthulucene. This Chthulucene is neither sacred nor secular; this earthly worlding is thoroughly terran, muddled, and mortal—and at stake now.

Mobile, many-armed predators, pulsating through and over the coral reefs, octopuses are called spiders of the sea. And so *Pimoida chthulhu* and *Octopus cyanea* meet in the webbed tales of the Chthulucene.⁶⁹

All of these stories are a lure to proposing the Chthulucene as a needed third story, a third netbag for collecting up what is crucial for ongoing, for staying with the trouble.⁷⁰ The chthonic ones are not confined to a vanished past. They are a buzzing, stinging, sucking swarm now, and human beings are not in a separate compost pile. We are humus, not Homo, not anthropos; we are compost, not posthuman. As a suffix, the word *ka-inos*, “-cene,” signals new, recently made, fresh epochs of the thick present. To renew the biodiverse powers of terra is the sympoietic work and play of the Chthulucene. Specifically, unlike either the Anthropocene or the Capitalocene, the Chthulucene is made up of ongoing multispecies stories and practices of becoming-with in times that remain at stake, in precarious times, in which the world is not finished and the sky has not fallen—yet. We are at stake to each other. Unlike the dominant dramas of Anthropocene and Capitalocene discourse, human beings are not the only important actors in the Chthulucene, with all other beings able simply to react. The order is reknitted: human beings are with and of the earth, and the biotic and abiotic powers of this earth are the main story.

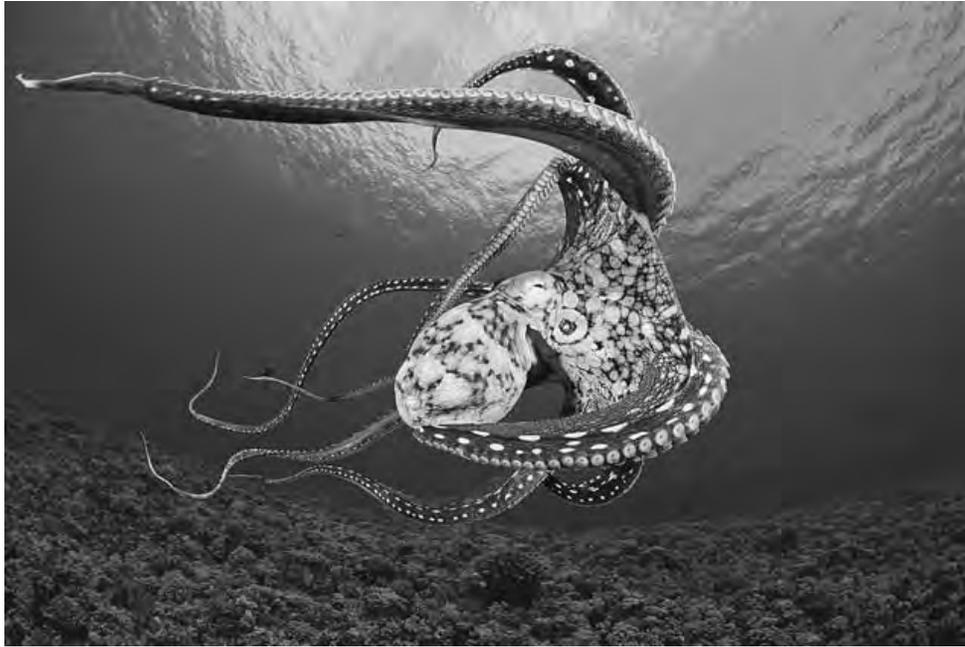
However, the doings of situated, actual human beings matter. It matters with which ways of living and dying we cast our lot rather than others. It matters not just to human beings, but also to those many critters across taxa which and whom we have subjected to exterminations, extinctions, genocides, and prospects of futurelessness. Like it or not, we are in the string figure game of caring for and with precarious worldings made terribly more precarious by fossil-burning man making new fossils as rapidly as possible in orgies of the Anthropocene and Capitalocene. Diverse human and nonhuman players are necessary in every fiber of the tissues of the urgently needed Chthulucene story. The chief actors are not restricted to the too-big players in the too-big stories of Capitalism and the Anthropos, both of which invite odd apocalyptic panics and

even odder disengaged denunciations rather than attentive practices of thought, love, rage, and care.

Both the Anthropocene and the Capitalocene lend themselves too readily to cynicism, defeatism, and self-certain and self-fulfilling predictions, like the “game over, too late” discourse I hear all around me these days, in both expert and popular discourses, in which both technocratic geoengineering fixes and wallowing in despair seem to coinfect any possible common imagination. Encountering the sheer not-us, more-than-human worlding of the coral reefs, with their requirements for ongoing living and dying of their myriad critters, is also to encounter the knowledge that at least 250 million human beings today depend directly on the ongoing integrity of these holobiomes for their own ongoing living and dying well. Diverse corals and diverse people and peoples are at stake to and with each other. Flourishing will be cultivated as a multi-species response-ability without the arrogance of the sky gods and their minions, or else biodiverse terra will flip out into something very slimy, like any overstressed complex adaptive system at the end of its abilities to absorb insult after insult.

Corals helped bring the Earthbound into consciousness of the Anthropocene in the first place. From the start, uses of the term *Anthropocene* emphasized human-induced warming and acidification of the oceans from fossil-fuel-generated CO₂ emissions. Warming and acidification are known stressors that sicken and bleach coral reefs, killing the photosynthesizing zooanthellae and so ultimately their cnidarian symbionts and all of the other critters belonging to myriad taxa whose worlding depends on intact reef systems. Corals of the seas and lichens of the land also bring us into consciousness of the Capitalocene, in which deep-sea mining and drilling in oceans and fracking and pipeline construction across delicate lichen-covered northern landscapes are fundamental to accelerating nationalist, transnationalist, and corporate unworlding.

But coral and lichen symbionts also bring us richly into the storied tissues of the thickly present Chthulucene, where it remains possible—just barely—to play a much better SF game, in nonarrogant collaboration with all those in the muddle. We are all lichens; so we can be scraped off the rocks by the Furies, who still erupt to avenge crimes against the earth. Alternatively, we can join in the metabolic transformations between and among rocks and critters for living and dying well. “Do you realize,’ the phytolinguist will say to the aesthetic critic, ‘that [once upon a time] they couldn’t even read Eggplant?’ And they will smile at our



2.7. Day octopus, *Octopus cyanea*, in the water near Lanai, Hawaii. Photograph by David Fleetham. © OceanwideImages.com.

ignorance, as they pick up their rucksacks and hike on up to read the newly deciphered lyrics of the lichen on the north face of Pike's Peak."⁷¹

Attending to these ongoing matters returns me to the question that began this chapter. What happens when human exceptionalism and the utilitarian individualism of classical political economics become unthinkable in the best sciences across the disciplines and interdisciplines? Seriously unthinkable: not available to think with. Why is it that the epochal name of the Anthropos imposed itself at just the time when understandings and knowledge practices about and within symbiogenesis and sympoietics are wildly and wonderfully available and generative in all the humusities, including noncolonizing arts, sciences, and politics? What if the doleful doings of the Anthropocene and the unworldings of the Capitalocene are the last gasps of the sky gods, not guarantors of the finished future, game over? It matters which thoughts think thoughts. We must think!

The unfinished Chthulucene must collect up the trash of the Anthropocene, the exterminism of the Capitalocene, and chipping and shredding and layering like a mad gardener, make a much hotter compost pile for still possible pasts, presents, and futures.

are many names in many Aboriginal languages, for example, *matjka-wuma* in Yirrkala. See Davidson, “Aboriginal Australian String Figures.” See also “Survival and Revival of the String Figures of Yirrkala.”

- 34 “Batman’s Treaty,” “Batman Park,” and “Wurundjeri,” *Wikipedia*. I leave the *Wikipedia* references unadorned partly to mark my own ignorance, partly in appreciation of a flawed but remarkable tool.
- 35 Downing, “Wild Harvest—Bird Poo.”

Chapter 2: Tentacular Thinking

Epigraph 1: Scott Gilbert, “We Are All Lichens Now.” See Gilbert, Sapp, and Tauber, “A Symbiotic View of Life.” Gilbert has erased the “now” from his rallying cry; we have always been symbionts—genetically, developmentally, anatomically, physiologically, neurologically, ecologically.

Epigraph 2: These sentences are on the rear cover of Stengers and Despret, *Women Who Make a Fuss*. From Virginia Woolf’s *Three Guineas*, “think we must” is the urgency relayed to feminist collective thinking-with in *Women Who Make a Fuss* through Puig de la Bellacasa, *Penser nous devons*.

- 1 Hormiga, “A Revision and Cladistic Analysis of the Spider Family Pimoidae.” See “*Pimoida cthulhu*,” *Wikipedia*; “Hormiga Laboratory.”
- 2 “The brand of holist ecological philosophy that emphasizes that ‘everything is connected to everything,’ will not help us here. Rather, everything is connected to *something*, which is connected to something else. While we may all *ultimately* be connected to one another, the specificity and proximity of connections matters—*who we are bound up with and in what ways*. Life and death happen inside these relationships. And so, we need to understand how particular human communities, as well as those of other living beings, are entangled, and how these entanglements are implicated in the production of both extinctions and their accompanying patterns of amplified death” (Van Dooren, *Flight Ways*, 60).
- 3 Two indispensable books by my colleague-sibling from thirty-plus years in the History of Consciousness Department at the University of California, Santa Cruz, guide my writing. Clifford, *Routes and Returns*.
- 4 *Chthonic* derives from ancient Greek *khthonios*, of the earth, and from *khthōn*, earth. Greek mythology depicts the chthonic as the underworld, beneath the earth; but the chthonic ones are much older (and younger) than those Greeks. Sumeria is a riverine civilizational scene of emergence of great chthonic tales, including possibly the great circular snake eating its own tail, the polysemous Ouroboros (figure of the continuity of life, an Egyptian figure as early as 1600 BCE; Sumerian SF worlding dates to 3500 BCE or before). The chthonic will accrue many resonances throughout my chapter. See Jacobsen, *The Treasures of Darkness*. In lectures, conversations, and e-mails, the scholar of ancient Middle Eastern worlds at UC Santa Cruz, Gildas Hamel, gave me “the abyssal and elemental forces before they were astralized by chief gods and their tame committees” (personal communication,

June 12, 2014). Cthulhu (note spelling), luxuriating in the science fiction of H. P. Lovecraft, plays no role for me, although it/he did play a role for Gustavo Hormiga, the scientist who named my spider demon familiar. For the monstrous male elder god (Cthulhu), see Lovecraft, *The Call of Cthulhu*.

I take the liberty of rescuing my spider from Lovecraft for other stories, and mark the liberation with the more common spelling of chthonic ones. Lovecraft's dreadful underworld chthonic serpents were terrible only in the patriarchal mode. The Chthulucene has other terrors—more dangerous and generative in worlds where such gender does not reign. Undulating with slippery eros and gravid chaos, tangled snakes and ongoing tentacular forces coil through the twenty-first century CE. Consider: Old English *oearth*, German *Erde*, Greek Gaia, Roman *terra*, Dutch *aarde*; Old English *w(e)oruld* (“affairs of life,” “a long period of time,” “the known life,” or “life on earth” as opposed to the “afterlife”), from a Germanic compound meaning “age of the human race” (*wer*); Old Norse *heimr*, literally “abode.” Then consider Turkish *dünya* and go to *dunyā* (the temporal world), an Arabic word that was passed to many other languages, such as Persian, Dari, Pashto, Bengali, Punjabi, Urdu, Hindi, Kurdish, Nepali, Turkish, Arumanian, and North Caucasian languages. *Dunyā* is also a loanword in Malay and Indonesian, as well as in Greek *δουνιας*—so many words, so many roots, so many pathways, so many mycorrhizal symbioses, even if we restrict ourselves only to Indo-European tangles. There are so many kin who might better have named this time of the Anthropocene that is at stake now. The anthropos is too much of a parochial fellow; he is both too big and too small for most of the needed stories.

- 5 Eva Hayward proposes the term *tentacularity*; her trans-thinking and -doing in spidery and coralline worlds entwine with my writing in SF patterns. See Hayward, “FingeryEyes”; “SpiderCitySex”; and “Sensational Jellyfish.” See Morgan, “Sticky Tales.” UK experimental artist Eleanor Morgan’s spider silk art spins many threads resonating with this chapter, tuned to the interactions of animals (especially arachnids and sponges) and humans. Morgan, “Website.”
- 6 Katie King aligns Hayward’s “fingery eyes” and “tentacularity” with “networked reenactments” or “transknowledges.” “Working out in a multiverse of articulating disciplines, interdisciplines, and multidisciplinarity, such transdisciplinary inspection actually *enjoys* the many flavors of details, offerings, passions, languages, things . . . One index for the evaluation of transdisciplinary work is how well it learns and models *how* to be affected or moved, how well it *opens up* unexpected elements of one’s own embodiments in lively and re-sensitizing worlds.” King, *Networked Reenactments*, 19. See also King, “A Naturalcultural Collection of Affections.” Think we must.
- 7 *Muddle*, Old Dutch for muddying the waters. I use *muddle* as a theoretical trope and soothing wallow to trouble the trope of visual clarity as the only sense and affect for mortal thinking. Muddles team with company. Empty spaces and clear vision are bad fictions for thinking, not worthy of SF or of contemporary biology. My speculative feminist courage has been fed by Puig de la Bellacasa, “Touching Technologies, Touching Visions.”

For a gorgeous animated model of a densely packed living neuron, where proteins muddle on their herky-jerky way to making cells work, see “Protein Packing: Inner Life of a Cell” and Zimmer, “Watch Proteins Do the Jitterbug.”

- 8 Ingold, *Lines*, 116–19.
- 9 The pile was made irresistible by Puig de la Bellacasa, “Encountering Bioinfrastructure.”
- 10 Art science activism infuses this book. In the struggle for multispecies environmental justice in the face of coal company mountaintop removal in her homeworld in West Virginia, with her wife Annie Sprinkle (environmental activist, radical adult film director and performer, former sex worker), UC Santa Cruz artist Beth Stephens made the “sexiest nature documentary ever,” *Goodbye Gauley Mountain: An Ecossexual Love Story*. The quote is from a review by Russ McSpadden, “Ecossexuals of the World Unite!” In love and rage (Emma Goldman), think we must (Virginia Woolf) for a habitable planet.
- 11 Throughout this essay I use the Latinate words *terran* and *terra*, even while I swim in Greek names and stories, including the material-semiotic story of Gaia and Bruno Latour’s “Gaia stories/geostories.” Terra is especially legible in SF, but Gaia is important in SF too. My favorite is John Varley’s Gaea Trilogy, *Titan* (1979), *Wizard* (1980), and *Demon* (1984). Varley’s Gaea is an old woman, who/which is a living being in the shape of a 1,300-kilometer-diameter Stanford torus, inhabited by many different species, in orbit around the planet Saturn. For a fan site, see “Gaea, the Mad Titan.” Latour’s Earthbound (“Terriens” in his French) and Stengers’s intrusive Gaia would recognize Varley’s irascible, unpredictable Gaea. Gaia is more legible in systems theories than Terra, as well as in “New Age” cultures. Gaia comes into her/its own in the Anthropocene, but Terra sounds a more earthy tone for me. However, Terra and Gaia are not in opposition, nor are the Earthbound, who are given to us in loving, risk-taking, powerful writing by Bruno Latour, in opposition to Terrans. Rather, Gaians and Terrans are in a queer planetwide litter of chthonic ones who must be re-membered urgently. It is in that sense that I hear together Isabelle Stengers’s “cosmopolitics” and my verbally miscegenated “Terrapolis.” We are making string figures together.
- 12 Allied to this kind of argument is Barad, *Meeting the Universe Halfway*. Outside (and inside) the odd thing named the West, there are myriad histories, philosophies, and practices—some civilizational, some urban, some neither—that propose living and dying in other knots and patterns that do not presume isolated, much less binary, unities and polarities that then need to be brought into connection. Various and dangerously configured relationality is just what is. Flawed but powerful systems theories are the best technoscientific models we have so far for many Gaian relationalities.

An American evolutionary biologist, David Barash, writes compellingly about convergences (not identities and not resources that can be hijacked to cure Western ills) between ecological sciences and various Buddhist streams, schools, and traditions that emphasize connectedness. Barash emphasizes that ways of living, dying, acting, and nurturing response-ability are embedded in these matters (*Bud-*

dhist Biology)). What if Western evolutionary and ecological sciences had been developed from the start within Buddhist instead of Protestant ways of worlding? Why do I find it so jarring that David Barash is a committed neo-Darwinian in evolutionary theory? See Barash, *Natural Selections*. The need for complexity theories tuned to paradox is obvious!

Based on his extensive study of Chinese knowledges and sciences, Joseph Needham asked a similar question to Barash's many years ago about embryology and biochemistry in *The Grand Titration: Science and Society in East and West*. Needham's organicism and Marxism are both crucial for this story, something to remember in thinking about how to configure what I will explore in this chapter under the sign *Capitalocene*. On Needham, see Haraway, *Crystals, Fabrics, and Fields*. What happens if we cultivate response-ability for the Capitalocene inside the netbags of sympoiesis, Buddhism, ecological evolutionary developmental biology (EcoEvoDevo), Marxism, Stengersian cosmopolitics, and other strong pulls against the modernizing foolishness of some analyses of capitalism? What happens if the relentless zero-sum games of neo-Darwinism give way to an extended evolutionary synthesis?

- 13 Dempster, "A Self-Organizing Systems Perspective on Planning for Sustainability." See 27–32 for a concise comparison of autopoietic and sympoietic systems. Table 1, p. 30, juxtaposes defining characteristics for autopoietic and sympoietic systems, such as: self-produced boundaries/lacking boundaries; organizationally closed/organizationally ajar; external structural coupling/internal and external structural coupling; autonomous units/complex amorphous entities; central control/distributed control; evolution between systems/evolution within systems; growth and development orientation/evolutionary orientation; steady state/potentially dramatic, surprising change; predictable/unpredictable.

Katie King told me about the Dempster thesis as we tried to sort out our overlapping but not identical pleasures and resistances to autopoiesis and sympoiesis. See King, "Toward a Feminist Boundary Object-Oriented Ontology . . . or Should It Be a Boundary Object-Oriented Feminism?"

- 14 Stengers, "Relaying a War Machine?," 134.
- 15 Strathern, *The Relation; Partial Connections; and Kinship, Law and the Unexpected*.
- 16 Strathern, *Reproducing the Future*, 10.
- 17 Baila Goldenthal (1925–2011) painted an extraordinary series of four Cat's Cradle-titled oil-on-wood panels in 1995–96 and an oil-on-canvas in 2008. For her and for me, cat's cradle is an open-ended practice of continuous weaving (see her Weavers Series, 1989–94). "The techniques of under-painting and glazing invoke historical time; the enigma of the game itself reflects the complexity of human relationships." Goldenthal, "Painting/Cats Cradle." Goldenthal relates to cat's cradle games as a metaphor for the game of life, and the intensely present, moving hands invite kinship with other tentacular beings. Her 2008 *Cat's Cradle/String Theory* is the cover image for *Nuclear Abolition Forum*, no. 2 (2013), an issue titled "Moving beyond Nuclear Deterrence to a Nuclear Weapons Free World." Metamorphosis, fragility, temporality, disintegration, revelation—these are everywhere

- in her work. A student of the Kabbalah and of South Asian Indian culture and philosophy, Goldenthal worked in oils, bronze, leaded glass, paper, photography, printmaking, film, and ceramics. She accomplished powerful work in sculpture and in two-dimensional formats. Goldenthal, "Resumé." Among my favorites is her *Desert Walls* of the mid-1980s, where she worked in photography and collage with tile, brick, straw, plaster, metal, and glass to evoke the visual enigmas of cliffs and rock walls of the U.S. desert Southwest.
- 18 Arendt, *Eichmann in Jerusalem*; Hartouni, *Visualizing Atrocity*, especially chapter 3, "Thoughtlessness and Evil." I set aside the strict humanism and the specific kind of thinking subject of Arendt's project, as well as her insistence on the essential solitude of thinking. Thinking-with in the SF compost pile of this essay is not an enemy to the profound secular self-examination of Arendt's historically situated human figure, but that is an argument for another day.
 - 19 Arendt characterized thinking as "training one's mind to going visiting." "This distancing of some things and bridging of others is part of the dialogue of understanding, for whose purposes direct experience establishes too close contact and mere knowledge erects artificial barriers." Arendt, "Truth and Politics," 241, quoted in Hartouni, *Visualizing Atrocity*, 75.
 - 20 Puig de la Bellacasa, "Matters of Care in Technoscience"; Puig de la Bellacasa, *Matters of Care*.
 - 21 Title of a conference that Anna Tsing and coworkers organized at the University of California, Santa Cruz, May 8–10, 2014: "Anthropocene: Arts of Living on a Damaged Planet."
 - 22 All quotations are from Tsing, *The Mushroom at the End of the World*, 34, 2, 4.
 - 23 Van Dooren, *Flight Ways*.
 - 24 Van Dooren's colleague Deborah Bird Rose is everywhere in this thinking, especially in her treatment of the undoing of the tissues of ongoingness, the killing of generations, which she called "double death" in *Reports from a Wild Country: Ethics for Decolonisation*. See also van Dooren and Rose, "Unloved Others"; van Dooren and Rose, "Storied-Places in a Multispecies City." The Extinction Studies Working Group, anchored in Australia, is a rich symposium gathering. See also Environmental Humanities South, anchored in Cape Town, South Africa.
 - 25 Van Dooren, "Keeping Faith with Death"; *Flight Ways*, chapter 5, "Mourning Crows: Grief in a Shared World." This writing is in SF exchange with Vinciane Despret's thinking about learning to be affected. See Despret, "The Body We Care For."
 - 26 Van Dooren, *Flight Ways*, 63–86. Also crucial to grasping thinking and semiotics outside the premises of modernist humanist doctrines, see Kohn, *How Forests Think*.
 - 27 Le Guin, "The Carrier Bag Theory," 166. Le Guin's essay (1986) shaped my thinking about narrative in evolutionary theory and of the figure of woman the gatherer in *Primate Visions*. Le Guin learned about the Carrier Bag Theory of Evolution from Elizabeth Fisher, *Women's Creation*, in that period of large, brave, speculative, worldly stories that burned in feminist theory in the 1970s and 1980s. Like speculative fabulation, speculative feminism was, and is, an SF practice. For a fuller

SF game with both Le Guin and Octavia Butler, see chapter 6, "Sowing Worlds: A Seed Bag for Terraforming with Earth Others." First published in Grebowicz and Merrick, *Beyond the Cyborg*.

28 Le Guin, "The Carrier Bag Theory," 169.

29 For introduction and elucidation of the "god trick" in science and politics, see Haraway, "Situated Knowledges."

30 Latour, Gifford Lectures, Lecture 3, "The Puzzling Face of a Secular Gaia." Quotation from lecture manuscript.

31 Latour, "War and Peace in an Age of Ecological Conflicts." Quotation from lecture manuscript. Latour's proportionality in this lecture is bracing:

Humans : business as usual :: the Earthbound : total subversion.

In "Feral Biologies," Anna Tsing uses the word *Holocene* to mean something radically different from Latour; but their basic arguments rub against each other in often edgy agreement, generating some interesting friction. Tsing refers to the Holocene as the timeplaces of possible resurgence after disturbance; the Anthropocene is the timeplace of radical reduction, radical simplification, radical obliteration of the refugia of the Holocene, from which resurgence of species assemblages could occur. Latour's and Tsing's different uses of the same important words illustrate how polysemous possibilities lurk even in closely scrutinized linguistic precincts. Unnecessary oppositions can be easily spun from such different elaborations of words, and the expertise of geologists only adds to language's generativity. I think some of Latour's and Tsing's hot friction comes from his reliance on Carl Schmitt and her love of Ursula K. Le Guin.

32 Latour's "Why Has Critique Run Out of Steam? From Matters of Fact to Matters of Concern" is a major landmark in our collective understanding of the corrosive, self-certain, and self-contained traps of nothing-but-critique. Cultivating response-ability requires much more from us. It requires the risk of being for some worlds rather than others and helping to compose those worlds with others. In multistranded SF worlding, Maria Puig de la Bellacasa recomposts Latour's "matters of concern" to ferment an even richer soil in her "Matters of Care in Technoscience."

33 Latour, "War and Peace in an Age of Ecological Conflicts," lecture manuscript.

34 To understand how the modernizing category of "belief" works in the United States in law, politics, and pedagogy, including religion and social science, see Harding, "Secular Trouble." The figure of the never properly belonging, always leaving and returning "Prodigal Daughter" further unpacks the enabling and disabling operations of "belief" in deVries, "Prodigal Knowledge." Tying knowledge practices to professions of belief in both religion and science is perhaps the single most difficult habit of thought to dislodge for Moderns, at least in the United States. Where belief is exacted, the Inquisition is never far behind. SF in the muddle of Terra/Gaia cannot exact belief, but can shape committed thinking companions. The figure for thinking-with in this ecology of practices is not so much "decision" as sympoietic "care" and "discernment." The Prodigal Daughter remains

a wayfarer, much more promising for pathways in troubled times than the paved road toward the feast prepared for the returning, forever-after obedient Prodigal Son and legitimate heir.

- 35 Latour, "War and Peace in an Age of Ecological Conflicts," lecture manuscript; Schmitt, *The Nomos of the Earth*. For a full exposition of his reliance on Schmitt's *hostis* and political theology, see Latour, Gifford Lectures, Lecture 5, "War of Humans and Earthbound": "If Humans are at war with It [Gaia], what about those whom I have proposed to call the Earthbound? Can they be 'artisans of peace'?" (unpublished lecture manuscript). Such artisans are what Latour works to nourish here and elsewhere.

His question deserves more space, but a few words about *hostis* are necessary. Latour and I both ate the "host" in the sacrificial Eucharistic feast, and so we know what it means to be in the material-semiotic world where sign and signifier have imploded in meaningful flesh. Neither of us fits very well in secular Protestant semiotics, dominant in the university and in science, and that shapes our approaches to science studies and much else. But note that the "host" that we ate—our communion—is firmly ensconced in the story of the acceptable sacrifice to the Father. Latour and I ate too much and too little when we consumed this host and refused (and still refuse) to disavow it. I have a case of permanent raging indignation, even as I hold fast to the joy and the implosion of metaphor and world. I need to know more about Latour's digestive comforts and discomforts because I suspect they are at the root of our different lures for changing the story for the Earthbound. In the sacrificial Eucharistic wording, there are strong kin ties, etymologically and historically, to the host of Schmitt, where we find the guest, hostage, one held in surety for another, generator and collector of debt, host as the one who feeds the traveler as guest, stranger to be respected even if killed, hostiles, host as an array armed for combat in the field of battle (a trial of strength). Not vermin, not trash, not *inimicus*, but those coproducing the engagement of war and so perhaps a new peace rather than extermination. But host has other tones too, ones that lead a little way to the chthonic and tentacular ones in the carrier bag story, where Latour and I may yet luckily be gathered and transformed by some old hag collecting dinner. We might be allowed to stay as guests, as companion species, especially if we are on the menu. The host is the habitat for the parasite, the condition of life and ongoingness for the parasite; this host is in the dangerous world-making contact zones of symbiogenesis and sympoiesis, where newly cobbled together, good-enough orders may or may not emerge from the ever so promiscuous and opportunistic associations of host and parasite. Perhaps Gaia's unchristian abyssal gut, habitat for chthonic powers, is the muddle for SF, where ongoingness remains at stake. This is the world that evokes this chapter's epigraph, "We are all lichens." (On the difficulty of becoming unchristian, see Anidjar, *Blood*. Anidjar also does very interesting things with Schmitt.)

But not so fast, my lichen selves and affiliates! First we have to wrestle with the ill-named Anthropocene. I am not against all trials of strength; after all, I love women's basketball. I just think trials of strength are the old story. Overvalued,

they are a bit like the never-ending task of cleaning the toilet—necessary but radically insufficient. On the other hand, there are excellent composting toilets . . . We can outsource some trials of strength to the ever-eager microbes to make more time and space for SF in other muddles.

36. Stengers, *Au temps des catastrophes*. Gaia intrudes in this text from p. 48 on. Stengers discusses the “intrusion of Gaïa” in numerous interviews, essays, and lectures. Discomfort with the ever more inescapable label of the Anthropocene, in and out of sciences, politics, and culture, pervades Stengers’s thinking, as well as that of many other engaged writers, including Latour, even as we struggle for another word. See Stengers in conversation with Heather Davis and Etienne Turpin, “Matters of Cosmopolitics.”

Stengers’s thinking about Gaia and the Lovelock-Margulis development of the Gaia hypothesis was from the start entwined with her work with Ilya Prigogine, which understood that strong linear coupling in complex systems theory entailed the possibility of radical global system change, including collapse. Prigogine and Stengers, *Order Out of Chaos*. The relation of Gaia to Chaos is an old one in science and philosophy. What I want to do is knot that emergence sympoietically into a worlding of ongoing chthonic powers, which is the material-semiotic time-space of the Chthulucene rather than Anthropocene or Capitalocene. This is part of what Stengers means when she says that her intrusive Gaia was “ticklish” from the start. “Her ‘autopoietic’ functioning is not her truth but what ‘we’ [human beings] have to face, and are able to read from our computer models, the face she turns on ‘us’” (e-mail from Stengers to Haraway, May 9, 2014).

- 37 Scientists estimate that this extinction “event,” the first to occur during the time of our species, could, as previous great extinction events have, but much more rapidly, eliminate 50 to 95 percent of existing biodiversity. Sober estimates anticipate half of existing species of birds could disappear by 2100. By any measure, that is a lot of double death. For a popular exposition, see *Voices for Biodiversity*, “The Sixth Great Extinction.” For a report by an award-winning science writer, see Kolbert, *The Sixth Extinction*. Reports from The Convention on Biological Diversity are more cautious about predictions and discuss the practical and theoretical difficulties of obtaining reliable knowledge, but they are not less sobering. For a disturbing report from summer 2015, see Ceballos et al., “Accelerated Modern Human-Induced Species Losses.”
- 38 Lovelock, “Gaia as Seen through the Atmosphere”; Lovelock and Margulis, “Atmospheric Homeostasis by and for the Biosphere.” For a video of a lecture to employees at the National Aeronautic and Space Agency in 1984, go to Margulis, “Gaia Hypothesis.” Autopoiesis was crucial to Margulis’s transformative theory of symbiogenesis, but I think if she were alive to take up the question, Margulis would often prefer the terminology and figural-conceptual powers of sympoiesis. I suggest that Gaia is a system mistaken for autopoietic that is really sympoietic. See chapter 3, “Sympoiesis.” Gaia’s story needs an intrusive makeover to knot with a host of other promising sympoietic tentacular ones for making rich compost, for going on. Gaia or Ge is much older and wilder than Hesiod (Greek poet around the

time of Homer, circa 750 to 650 BCE), but Hesiod cleaned her/it up in the *Theogony* in his story-setting way: after Chaos, “wide-bosomed” Gaia (Earth) arose to be the everlasting seat of the immortals who possess Olympus above (*Theogony*, 116–18, translated by Glenn W. Most, Loeb Classical Library), and the depths of Tartarus below (*Theogony*, 119). The chthonic ones reply, Nonsense! Gaia is one of theirs, an ongoing tentacular threat to the astralized ones of the Olympiad, not their ground and foundation, with their ensuing generations of gods all arrayed in proper genealogies. Hesiod’s is the old prick tale, already setting up canons in the eighth century BCE.

- 39 Although I cannot help but think more rational environmental and social/natural policies of all sorts would help!
- 40 Isabelle Stengers, from English compilation on Gaia sent by e-mail January 14, 2014.
- 41 I use “thing” in two senses that rub against each other: (1) the collection of entities brought together in the Parliament of Things that Bruno Latour called our attention to, and (2) something hard to classify, unsortable, and probably with a bad smell. Latour, *We Have Never Been Modern*.
- 42 Crutzen and Stoermer, “The ‘Anthropocene’”; Crutzen, “Geology of Mankind”; Zalasiewicz et al., “Are We Now Living in the Anthropocene?” Much earlier dates for the emergence of the Anthropocene are sometimes proposed, but most scientists and environmentalists tend to emphasize global anthropogenic effects from the late eighteenth century on. A more profound human exceptionalism (the deepest divide of nature and culture) accompanies proposals of the earliest dates, coextensive with *Homo sapiens* on the planet hunting big now-extinct prey and then inventing agriculture and domestication of animals. A compelling case for dating the Anthropocene from the multiple “great accelerations,” in earth system indicators and in social change indicators, from about 1950 on, first marked by atmospheric nuclear bomb explosions, is made by Steffen et al., “The Trajectory of the Anthropocene.” Zalasiewicz et al. argue that adoption of the term *Anthropocene* as a geological epoch by the relevant national and international scientific bodies will turn on stratigraphic signatures. Perhaps, but the resonances of the Anthropocene are much more disseminated than that. One of my favorite art investigations of the stigmata of the Anthropocene is Ryan Dewey’s “Virtual Places: Core Logging the Anthropocene in Real-Time,” in which he composes “core samples of the *ad hoc* geology of retail shelves.”
- 43 For a powerful ethnographic encounter in the 1990s with climate-change modeling, see Tsing, *Friction*, “Natural Universals and the Global Scale,” 88–112, especially “Global Climate as a Model,” 101–6. Tsing asks, “What makes global knowledge possible?” She replies, “Erasing collaborations.” But Tsing does not stop with this historically situated critique. Instead she, like Latour and Stengers, takes us to the really important question: “Might it be possible to attend to nature’s collaborative origins without losing the advantages of its global reach?” (95). “How might scholars take on the challenge of freeing critical imaginations from the specter of neoliberal conquest—singular, universal, global? Attention to the frictions of contingent

articulation can help us describe the effectiveness, and the fragility, of emergent capitalist—and globalist—forms. In this shifting heterogeneity there are new sources of hope, and, of course, new nightmares” (77). At her first climate-modeling conference in 1995, Tsing had an epiphany: “*The global scale takes precedence—because it is the scale of the model*” (103, italics in original). But this and related properties have a particular effect: they bring negotiators to an international, heterogeneous table, maybe not heterogeneous enough, but far from full of identical units and players. “The embedding of smaller scales into the global; the enlargement of models to include everything; the policy-driven construction of the models: Together these features make it possible for the models to bring diplomats to the negotiating table” (105). That is not to be despised.

The reports of the Intergovernmental Panel on Climate Change (IPCC) are necessary documents and excellent illustrations of Tsing’s accounts: *Climate Change 2014: Mitigation of Climate Change* and *Climate Change 2014: Impacts, Adaptation, and Vulnerability*.

Tsing’s stakes in her intimate tracking of the relentless ethnographic specificities of far-flung chains of intimate dealings and livings are to hold in productive, nonutopian friction the scale-making power of the things climate-change models do with the life-and-death messiness of place- and travel-based wordings that always make even our best and most necessary universals very lumpy. She seeks and describes multiple situated wordings and multiple sorts of translations to engage globalism. “Attention to friction opens up the possibility of an ethnographic account of global interconnection” (6). Appreciation of what she calls “weediness” is indispensable: “To be aware of the necessity for careful coalitions with those whose knowledges and pleasures come from other sources is the beginning of nonimperialist environmentalism” (170). The *hostis* will not make an appearance in this string figuring, but mushrooms as guides for living in the ruins most certainly will. See Tsing, *The Mushroom at the End of the World*.

- 44 The Anthropocene Working Group, which was established in 2008 to report to the International Union of Geological Sciences and the International Commission on Stratigraphy on whether to name a new epoch in the geological timeline, aimed to issue its final report in 2016. See *Newsletter of the Anthropocene Working Group*, volumes 4 and 5.
- 45 For a photo gallery of fiery images of the Man burning at the end of the festival, see “Burning Man Festival 2012.” Attended by tens of thousands of human people (and an unknown number of dogs), Burning Man is an annual week-long festival of art and (commercial) anarchism held in the Black Rock Desert of Nevada since 1990 and on San Francisco’s Baker Beach from 1986 to 1990. The event’s origins tie to San Francisco artists’ celebrations of the summer solstice. “The event is described as an experiment in community, art, radical self-expression, and radical self-reliance” (“Burning Man,” *Wikipedia*). The globalizing extravaganzas of the Anthropocene are not the drug- and art-laced wording of Burning Man, but the iconography of the immense fiery “Man” ignited during the festival is irresistible. The first burning effigies on the beach in San Francisco were of a 9-foot-tall

wooden Man and a smaller wooden dog. By 1988 the Man was 40 feet tall and dogless. Relocated to a dry lakebed in Nevada, the Man topped out in 2011 at 104 feet. This is America; supersized is the name of the game, a fitting habitat for the Anthropos.

“Anthropos” (ἄνθρωπος) is an ambiguous word with contested etymologies. What Anthropos never figures is the rich generative home of a multispecies earth. The *Online Etymology Dictionary* states that it comes from the Greek *aner*, “man,” “as opposed to a woman, a god, or a boy.” Just what I suspected! Or, “Anthropos sometimes is explained as a compound of *aner* and *ops* (genitive *opos*) ‘eye, face’; so literally ‘he who has the face of a man.’” Or, sometimes, the shape of a man. Biblical scholars find it hard to make the Greek *ἄνθρωπος* include women, and it complicates translations in fascinating ways: see <http://www.bible-researcher.com/anthropos.html> (accessed August 7, 2015). Other sources give the meaning of the compound as “that which is below, hence earthly, human,” or, the “upward looking one,” and so below, lamentably on earth. Unlike the animals, man as anthropos “looks up at what he sees”: <http://www.science-bbs.com/114-lang/0e74f4484bff3feo.htm> (accessed August 7, 2015). The Anthropos is *not* Latour’s Earthbound.

It is safe to say that Eugene Stoermer and Paul Crutzen were not much vexed by these ambiguities. Still, thank the heavens, looking up, their human eyes were firmly on the earth’s atmospheric carbon burden. Or, also, swimming in too hot seas with the tentacular ones, their eyes were the optic-haptic fingery eyes of marine critters in diseased and dying coral symbioses. See Hayward, “FingeryEyes.”

46 Klare, “The Third Carbon Age,” writes, “According to the International Energy Agency (IEA), an inter-governmental research organization based in Paris, cumulative worldwide investment in new fossil-fuel extraction and processing will total an estimated \$22.87 trillion between 2012 and 2035, while investment in renewables, hydropower, and nuclear energy will amount to only \$7.32 trillion.” Nuclear, after Fukushima! Not to mention that none of these calculations prioritize a much lighter, smaller, more modest human presence on earth, with all its critters. Even in its “sustainability” discourses, the Capitalocene cannot tolerate a multispecies world of the Earthbound. For the switch in Big Energy’s growth strategies to nations with the weakest environmental controls, see Klare, “What’s Big Energy Smoking?” See also Klare, *The Race for What’s Left*.

47 Heavy tar sand pollution must break the hearts and shatter the gills of every Ter-ran, Gaian, and Earthbound critter. The toxic lakes of wastewater from tar sand oil extraction in northern Alberta, Canada, shape a kind of new Great Lakes region, with more giant “ponds” added daily. Current area covered by these lakes is about 50 percent greater than the area covered by the world city of Vancouver. Tar sands operations return almost none of the vast quantities of water they use to natural cycles. Earthbound peoples trying to establish growing things at the edges of these alarmingly colored waters filled with extraction tailings say that successional processes for re-establishing sympoietic biodiverse ecosystems, if they prove possible at all, will be an affair of decades and centuries. See Pembina Institute, “Alberta’s

Oil Sands,” and Weber, “Rebuilding Land Destroyed by Oil Sands May Not Restore It.” Only Venezuela and Saudi Arabia have more oil reserves than Alberta. All that said, the Earthbound, the Terrans, do not cede either the present or the future; the sky is lowering, but has not fallen, yet. Pembina Institute, “Oil Sands Solutions.” First Nation, Métis, and Aboriginal peoples are crucial players in every aspect of this unfinished story. See the website for the Tar Sands Solutions Network. For melting sea ice in the Arctic, see figure 2.4, p. 48.

- 48 Photograph from NASA Earth Observatory, 2015 (public domain). If flame is the icon for the Anthropocene, I use the missing ice and the unblocked Northwest Passage to figure the Capitalocene. The Soufan Group provides strategic security intelligence services to governments and multinational organizations. Its report “TSG IntelBrief: Geostrategic Competition in the Arctic” includes the following quotes: “The *Guardian* estimates that the Arctic contains 30 percent of the world’s undiscovered natural gas and 15 percent of its oil.” “In late February, Russia announced it would form a strategic military command to protect its Arctic interests.” “Russia, Canada, Norway, Denmark, and the US all make some claim to international waters and the continental shelf in the Arctic Ocean.” “[A Northwest Passage] route could provide the Russians with a great deal of leverage on the international stage over China or any other nation dependent on sea commerce between Asia and Europe.”

The province of Alberta in Canada ranks third in the world after Saudi Arabia and Venezuela for proven global crude reserves. Almost all of Alberta’s oil is in the tar sands in the north of the province, site of the great new petrotoxic lakes of North America. See Alberta Energy, “Facts and Statistics.” The Capitalocene in action! See the Indigenous Environmental Network, “Canadian Indigenous Tar Sands Campaign.” Over twenty corporations operate in the tar sands in the home area of many indigenous peoples, including the First Nation Mikisew Cree, Athabasca Chipewyan, Fort McMurray, Fort McKay Cree, Beaver Lake Cree, Chipewyan Prairie, and also the Métis.

- 49 Klein, “How Science Is Telling Us All to Revolt”; Klein, *The Shock Doctrine*.
- 50 *Capitalocene* is one of those words like *sympoiesis*; if you think you invented it, just look around and notice how many other people are inventing the term at the same time. That certainly happened to me, and after I got over a small fit of individualist pique at being asked whom I got the term *Capitalocene* from—hadn’t I coined the word? (“Coin”!) And why do other scholars almost always ask women which male writers their ideas are indebted to?—I recognized that not only was I part of a cat’s cradle game of invention, as always, but that Jason Moore had already written compelling arguments to think with, and my interlocutor both knew Moore’s work and was relaying it to me. Moore himself first heard the term *Capitalocene* in 2009 in a seminar in Lund, Sweden, when then graduate student Andreas Malm proposed it. In an urgent historical conjuncture, words-to-think-with pop out all at once from many bubbling cauldrons because we all feel the need for better netbags to collect up the stuff crying out for attention. Despite its problems, the term *Anthropocene* was and is embraced because it collects up many matters of fact, concern, and care; and I hope *Capitalocene* will roll off myriad tongues soon.

In particular, see the work of Jason Moore, a creative Marxist sociologist at Binghamton University in New York. Moore is coordinator of the World-Ecology Research Network. For his first Capitalocene argument, see Moore, “Anthropocene, Capitalocene, and the Myth of Industrialization.” See Moore, *Capitalism and the Web of Life*.

- 51 To get over Eurocentrism while thinking about the history of pathways and centers of globalization over the last few centuries, see Flynn and Giráldez, *China and the Birth of Globalisation in the 16th Century*. For analysis attentive to the differences and frictions among colonialisms, imperialisms, globalizing trade formations, and capitalism, see Ho, “Empire through Diasporic Eyes” and *The Graves of Tarem*.
- 52 In “Anthropocene or Capitalocene, Part III,” Jason Moore puts it this way: “This means that capital and power—and countless other strategic relations—do not act upon nature but develop through the web of life. ‘Nature’ is here offered as the relation of the whole. Humans live as a specifically endowed (but not special) environment-making species within Nature. Second, capitalism in 1800 was no Athena, bursting forth, fully grown and armed, from the head of a carboniferous Zeus. Civilizations do not form through Big Bang events. They emerge through cascading transformations and bifurcations of human activity in the web of life . . . [For example,] the long seventeenth century forest clearances of the Vistula Basin and Brazil’s Atlantic Rainforest occurred on a scale, and at a speed, between five and ten times greater than anything seen in medieval Europe.”
- 53 Crist, “On the Poverty of Our Nomenclature,” 144. Crist does superb critique of the traps of Anthropocene discourse, as well as gives us propositions for more imaginative worlding and ways to stay with the trouble. For entangled, dissenting papers that both refuse and take up the name *Anthropocene*, see videos from the conference “Anthropocene Feminism.” For rich interdisciplinary research, organized by Anna Tsing and Nils Ole Bubandt, that brings together anthropologists, biologists, and artists under the sign of the Anthropocene, see AURA: Aarhus University Research on the Anthropocene.
- 54 I owe the insistence on “big-enough stories” to Clifford, *Returns*: “I think of these as ‘big enough’ histories, able to account for a lot, but not for everything—and without guarantees of political virtue” (201). Rejecting one big synthetic account or theory, Clifford works to craft a realism that “works with open-ended (because their linear historical time is ontologically unfinished) ‘big-enough stories,’ sites of contact, struggle, and dialogue” (85–86).
- 55 Pignarre and Stengers, *La sorcellerie capitaliste*. Latour and Stengers are deeply allied in their fierce rejection of discourses of denunciation. They have both patiently taught me to understand and relearn in this matter. I love a good denunciation! It is a hard habit to unlearn.
- 56 It is possible to read Max Horkheimer and Theodor Adorno’s *Dialectic of Enlightenment* as an allied critique of Progress and Modernization, even though their resolute secularism gets in their own way. It is very hard for a secularist to really listen to the squid, bacteria, and angry old women of Terra/Gaia. The most likely Western Marxist allies, besides Marx, for nurturing the Chthulucene in the belly

- of the Capitalocene are Antonio Gramsci, *Selections from the Prison Notebooks*, and Stuart Hall. Hall's immensely generative essays extend from the 1960s through the 1990s. See, for example, Morley and Chen, *Stuart Hall*.
- 57 See Gilson, "Octopi Wall Street!" for the fascinating history of cephalopods figuring the depredations of Big Capital in the United States (for example, the early twentieth-century John D. Rockefeller/Standard Oil octopus strangling workers, farmers, and citizens in general with its many huge tentacles). Resignification of octopuses and squids as chthonic allies is excellent news. May they squirt inky night into the visualizing apparatuses of the technoid sky gods.
- 58 Hesiod's *Theogony* in achingly beautiful language tells of Gaia/Earth arising out of Chaos to be the seat of the Olympian immortals above and of Tartarus in the depths below. She/it is very old and polymorphic and exceeds Greek tellings, but just how remains controversial and speculative. At the very least, Gaia is not restricted to the job of holding up the Olympians! The important and unorthodox scholar-archaeologist Marija Gimbutas claims that Gaia as Mother Earth is a later form of a pre-Indo-European, Neolithic Great Mother. In 2004, filmmaker Donna Reed and neopagan author and activist Starhawk released a collaborative documentary film about the life and work of Gimbutas, *Signs out of Time*. See Belili Productions, "About Signs out of Time"; Gimbutas, *The Living Goddesses*.
- 59 To understand what is at stake in "non-Euclidean" storytelling, go to Le Guin, *Always Coming Home* and "A Non-Euclidean View of California as a Cold Place to Be."
- 60 "The Thousand Names of Gaia: From the Anthropocene to the Age of the Earth," International Colloquium, Rio de Janeiro, September 15-19, 2014.
- 61 The bee was one of Potnia Theron's emblems, and she is also called Potnia Melissa, Mistress of the Bees. Modern Wiccans re-member these chthonic beings in ritual and poetry. If fire figured the Anthropocene, and ice marked the Capitalocene, it pleases me to use red clay pottery for the Chthulucene, a time of fire, water, and earth, tuned to the touch of its critters, including its people. With her PhD writing on the riverine goddess Ratu Kidul and her dances now performed on Bali, Raissa DeSmet (Trumbull) introduced me to the web of far-traveling chthonic tentacular ones emerging from the Hindu serpentine Nagas and moving through the waters of Southeast Asia. DeSmet, *A Liquid World*.
- 62 Links between Potnia Theron and the Gorgon/Medusa continued in temple architecture and building adornment well after 600 BCE, giving evidence of the tenacious hold of the chthonic powers in practice, imagination, and ritual, for example, from the fifth through the third centuries BCE on the Italian peninsula. The dread-full Gorgon figure faces outward, defending against exterior dangers, and the no less awe-full Potnia Theron faces inward, nurturing the webs of living. See Busby, *The Temple Terracottas of Etruscan Orvieto*. The Christian Mary, Virgin Mother of God, who herself erupted in the Near East and Mediterranean worlds, took on attributes of these and other chthonic powers in her travels around the world. Unfortunately, Mary's iconography shows her ringed by stars and crushing the head of the snake (for example, in the Miraculous Medal dating from an early

nineteenth-century apparition of the Virgin), more than allying herself with earth powers. The “lady surrounded by stars” is a Christian scriptural apocalyptic figure for the end of time. That is a bad idea. Throughout my childhood, I wore a gold chain with the Miraculous Medal. Finally and luckily, it was her residual chthonic infections that took hold in me, turning me from both the secular and also the sacred, and toward humus and compost.

- 63 The Hebrew word *Deborah* means “bee,” and she was the only female judge mentioned in the Bible. She was a warrior and counselor in premonarchic Israel. The *Song of Deborah* may date to the twelfth century BCE. Deborah was a military hero and ally of Jael, one of the 4Js in Joanna Russ’s formative feminist science fiction novel *The Female Man*.

In April 2014, the Reverend Billy Talen and the Church of Stop Shopping exorcised the robobee from the Micro Robotics Laboratories at Harvard. The robobee is a high-tech drone bee that is intended to replace overworked and poisoned biological pollinating bees as they become more and more diseased and endangered. Honeybeealajah, old stories live! See Talen, “Beware of the Robobee,” and Finnegan, “Protestors Sing Honeybeelujahs against Robobees.” Or, as Brad Werner put it at the American Geophysical Union Meetings, Revolt! Do we hear the buzzing yet? It is time to sting. It is time for a chthonic swarm. It is time to take care of the bees.

- 64 “Erinyes 1.”

- 65 Martha Kenney pointed out to me that the story of the Ood, in the long-running British science fiction TV series *Doctor Who*, shows how the squid-faced ones became deadly to humanity only after they were mutilated, cut off from their symchthonic hive mind, and enslaved. The humanoid empathic Ood have sinuous tentacles over the lower portion of their multifolded alien faces; and in their proper bodies they carry their hindbrains in their hands, communicating with each other telepathically through these vulnerable, living, exterior organs (organons). Humans (definitely not the Earthbound) cut off the hindbrains and replaced them with a technological communication-translator sphere, so that the isolated Ood could only communicate through their enslavers, who forced them into hostilities. I resist thinking the Ood techno-communicators are a future release of the iPhone, but it is tempting when I watch the faces of twenty-first-century humans on the streets, or even at the dinner table, apparently connected only to their devices. I am saved from this ungenerous fantasy by the SF fact that in the episode “Planet of the Ood,” the tentacular ones were freed by the actions of Ood Sigma and restored to their nonsingular selves. *Doctor Who* is a much better story cycle for going-on-with than *Star Trek*.

For the importance of reworking fables in sciences and other knowledge practices, see Kenney, “Fables of Attention.” Kenney explores different genres of fable, which situate what she calls unstable “wild facts” in relation to proposing and testing the strength of knowledge claims. She investigates strategies for navigating uncertain terrain, where the productive tensions between fact and fiction in actual practices are necessary.

- 66 “Medousa and Gorgones.”
- 67 Suzy McKee Charnas’s *Holdfast Chronicles*, beginning in 1974 with *Walk to the End of the World*, is great SF for thinking about feminists and their horses. The sex is exciting if very incorrect, and the politics are bracing.
- 68 Eva Hayward first drew my attention to the emergence of Pegasus from Medusa’s body and of coral from drops of her blood. Hayward, “The Crochet Coral Reef Project,” writes: “If coral teaches us about the reciprocal nature of life, then how do we stay obligated to environments—many of which we made unlivable—that now sicken us? . . . Perhaps Earth will follow Venus, becoming uninhabitable due to rampaging greenhouse effect. Or, maybe, we will rebuild reefs or construct alternate homes for the oceans’ refugees. Whatever the conditions of our future, we remain obligate partners with oceans.” See Wertheim and Wertheim, *Crochet Coral Reef*.
- 69 I am inspired by the 2014–15 Monterey Bay Aquarium exhibition *Tentacles: The Astounding Lives of Octopuses, Squids, and Cuttlefish*. See Detienne and Vernant, *Cunning Intelligence in Greek Culture and Society*, with thanks to Chris Connery for this reference in which cuttlefish, octopuses, and squid play a large role. Polymorphy, the capacity to make a net or mesh of bonds, and cunning intelligence are the traits the Greek writers foregrounded. “Cuttlefish and octopuses are pure *áporai* and the impenetrable pathless night they secrete is the most perfect image of their *metis*” (38). Chapter 5, “The Orphic Metis and the Cuttle-Fish of Thetis,” is the most interesting for the Chthulucene’s own themes of ongoing looping, becoming-with, and polymorphism. “The suppleness of molluscs, which appear as a mass of tentacles (*polúplokoi*), makes their bodies an interlaced network, a living knot of mobile animated bonds” (159). For Detienne and Vernant’s Greeks, the polymorphic and supple cuttlefish are close to the primordial multisexual deities of the sea—ambiguous, mobile and ever changing, sinuous and undulating, presiding over coming-to-be, pulsating with waves of intense color, cryptic, secreting clouds of darkness, adept at getting out of difficulties, and having tentacles where proper men would have beards.
- 70 See Haraway and Kenney, “Anthropocene, Capitalocene, Chthulucene.”
- 71 Le Guin, “‘The Author of Acacia Seeds’ and Other Extracts from the *Journal of the Association of Therolinguistics*,” 175.

Chapter 3: Sympoiesis

This chapter is written in honor of Lynn Margulis (1938–2011) and Alison Jolly (1937–2014).

- 1 See *Never Alone* (Kisima Ingitchuna).
- 2 The large high-resolution giclée reproduction was printed on canvas with non-fading inks. Inspired by Margulis and Sagan, *Dazzle Gradually*, Dubiner’s original gouache painting was 23 by 35 inches. Dubiner wrote, “The large red protozoan *Urostyla grandis* based on a 1959 drawing by Stein in Leipzig. The purple protozoan