

We also face a barrage of messages that tell us to keep moving forward, to get the newer model, to have more babies, to get bigger. There is a lot of pressure to grow.

We do not think this work is simple. It requires moving beyond the disciplinary prejudices into which each scholar is trained, to instead take a generous view of what varied knowledge practices might offer. In this spirit, we begin with a literary essay that offers the fine description necessary to pay attention to ruins, but later move to a scientific report on the very long history of human-caused extinctions and an anthropological guide on how to read landscape history in the shapes of trees. These and much more open up the curiosity about life on earth that we will need to limit the destruction we call Anthropocene and protect the Holocene entanglements that we need to survive.

Our era of human destruction has trained our eyes only on the immediate promises of power and profits. This refusal of the past, and even the present, will condemn us to continue fouling our own nests. How can we get back to the pasts we need to see the present more clearly? We call this return to multiple pasts, human and not human, "ghosts." Every landscape is haunted by past ways of life. We see this clearly in the presence of plants whose animal seed-dispersers are no longer with us. Some plants have seeds so big that only big animals can carry them to new places to germinate. When these animals became extinct, their plants could continue without them, but they have been unable to disperse their seeds very well. Their distribution is curtailed; their population dwindles. This is an example of what we are calling haunting.

Anthropogenic landscapes are also haunted by imagined futures. We are willing to turn things into rubble, destroy atmospheres, sell out companion species in exchange for dreamworlds of progress.

Haunting is quite properly eerie: the presence of the past often can be felt only indirectly, and so we extend our senses beyond their comfort zones. Human-made radiocesium has this uncanny quality: it travels in water and soil; it gets inside plants and animals; they see it even as we learn to find its traces. It disturbs us in its indeterminacy; this is a quality of ghosts.

As anthropologists, we imagine our talk of ghosts in kinship with commonalities around the world, Western and non-Western, who offer non-ecological descriptions of the landscape and its hauntings. Rather than an

priori distinction between modern and nonmodern, however, we open our analysis to practical ways of learning what is out there: the past and the present around us. This book is not about cosmologies but rather about on-the-ground observations, and from varied historical diffractions and points of view. Snake spirits and radioactive clouds share our attention as each draws us closer to the haunted quality of ruined landscapes.

Our use of the term "Anthropocene" does not imagine a homogeneous human race. We write in dialogue with those who remind readers of unequal relations among humans, industrial ecologies, and human insignificance in the web of life by writing instead of Capitalocene, Plantationocene, or Chthulucene (see Haraway, this volume). Our use of "Anthropocene" intends to join the conversation—but not to accept the worst uses of the term, from green capitalism to technopositivist hubris.

As we introduce the chapters, we want to show you both their practical gifts for reading landscapes and their work in grasping that which is hard to grasp—the spookiness of the past in the present. In this introduction we offer the wind as a figure for this uncanniness. Winds are hard to pin down, and yet material; they might convey some of our sense of haunting. Each paragraph in grey italics introduces an article from our volume through its haunting qualities. (Bold phrases are key themes in direct quotation from the essays.) We have included pieces from the "Monsters" half of the book along with "Ghosts" since the sections tell intertwined stories. Although our analytic frames deserve some separation, monsters and ghosts cannot be segregated. Meanwhile, we also use sentences in italics to index crosscurrents among our multiple authorial voices.

The Santa Ana winds pour into Los Laureles Canyon along the Tijuana-San Diego border. The wind is hot and dry, and it carries ghosts. Tires are everywhere in this canyon, writes Lesley Stern. Garbage dumps, bulldozed mesas, and steel-fenced borders mix with invasive plants and native gardens in weedy shantytowns. Here is the debris of capitalist waste, the spectacular afterlives of discarded things. Some tires are repurposed as building materials. Others lie around, dumped by careless dealers. Traffic from the United States flows southbound into Mexico unchecked, not so for reverse traffic. The canyon remembers the movement of things, including unlikely tomatoes growing through toxic sewers and cracked cement. Traces of past, present, and future mix in gardens that sprout from the graves of a violently uneven modernity.

when elephants trampled them. The ghosts of lost animals haunt these plants, even as the plants live on as our companions in the present.

Giant cave bears, straight-tusked elephants, and spotted hyenas once made their lives in Europe. The ground sloth, the mustodon, the shrub ox: these were animals of North America. Unprecedented numbers of megafauna species became extinct during the late Quaternary period. Their disappearance from Eurasia, Australia, and the Americas is closely linked to the arrival of modern humans in these continents. As biologist Jens-Christian Svenning argues, their loss is almost certainly anthropogenic.

As humans reshape the landscape, we forget what was there before. Ecologists call this forgetting the “shifting baseline syndrome.” Our newly shaped and ruined landscapes become the new reality. Admiring one landscape and its biological entanglements often entails forgetting many others. Forgetting, in itself, remakes landscapes, as we privilege some assemblages over others. Yet ghosts remind us. Ghosts point to our forgetting, showing us how living landscapes are imbued with earlier tracks and traces.

The native American flowers that are now missing from the Great Meadows of the University of California campus in Santa Cruz are ghosts to ecologist Ingrid Parker. Remembering missing flowers alerts her to the amnesia that distorts our perception of landscapes. Today, the Great Meadows are places of beauty and leisure, protected by law as natural havens. But the meadows are recent products of human disturbance. Almost devoid of the native plants that used to grow there, they are grasslands of colonially introduced species. The lifeworlds of indigenous flowers and the Native Americans that lived with them are specters in these grasslands.

Ghosts remind us that we live in an impossible present—a time of rupture, a world haunted with the threat of extinction. Deep histories tumble in unruly graves that are bulldozed into gardens of Progress. Yet *Arts of Living on a Damaged Planet* is also a book of weeds—the small, partial, and wild stories of more-than-human attempts to stay alive. Ghosts, too, are weeds that whisper tales of the many pasts and yet-to-comes that surround us. Considered through ghosts and weeds, worlds have ended many times before. Endings come with the death of a leaf, the death of a city, the death of a friendship, the death of

small promises and small stories. The landscapes grown from such endings are our disaster as well as our weedy hope.

Modernist Futures Have Made the Anthropocene

Bad deaths generate their own variety of ghosts. Across mainland Southeast Asia, “green” ghosts arise from deaths in war and in childbirth; these deaths occur before their proper time. How much more, then, does the violence of settler colonialism and capitalist expansion give rise to the ghosts of bad death, death out of time? Here is the terrain of what anthropologist Deborah Bird Rose calls “double death,” that is, extinction, which extinguishes times yet to come.

Rose has argued that white Australian settlers brought with them a particular, and peculiar, kind of time.⁴ They looked straight ahead to the *future*, a singular path of optimism and salvation informing their dreams and deeds. This *future* is a characteristic feature of commitments to modernity, that complex of symbolic and material projects for separating “nature” and “culture.” Moving toward this *future* requires ruthless ambition—and the willingness to participate in great projects of destruction while ignoring extinction as collateral damage. The settlers looked straight ahead as they destroyed native peoples and ecologies. The terrain carved out by this *future* is suffused with bad death ghosts.

Aleksandr Kupny grew up in the hopes of this future, and he is not afraid of ghosts. Kate Brown lets him lead us into the sarcophagus of the destroyed Chernobyl reactor, where he delightfully takes pictures of the wreckage. The ghosts are everywhere. “After forty years in radioactive fields,” he said, he can sense decaying atoms. “Everyone had warned him that the radioactivity would kill him, but he paid no heed, even after other friends in his community died. ‘The first few times we went below,’” Kupny said, “I recorded my dose and wrote it down, but then Sergei asked me why I did that. ‘What good will it do you to know? The less you know, the better you will sleep.’”

What better figure for the promises of modernity? The less you know, the better you will sleep. Meanwhile, our safety net of multispecies interdependencies tears and breaks.

Like every landscape, Los Laureles Canyon is haunted by its human and nonhuman histories.

The transformation of the formerly biodiverse estuaries and canyons of the U.S.-Mexico border illustrates the predicament of industrial modernity: condominiums line one side, while waste piles on the other. Directives to close the border ask us to shut our eyes to continuing transfers of wealth and waste. Ghosts accumulate on both sides of the border from the residues of violence.

As life-enhancing entanglements disappear from our landscapes, ghosts take their place. Some scientists argue that the rate of biological extinction is now several hundred times beyond its historical levels. We might lose a majority of all species by the end of the twenty-first century.¹ The problem is not just the loss of individual species but of assemblages, some of which we may not even know about, some of which will not recover. Mass extinction could ensue from cascading effects. In an entangled world where bodies are tumbled into bodies (see our Monsters), extinction is a multispecies event. The extinction of a critical number of species would mean the destruction of long-evolving coordinations and interdependencies. While we gain plastic gyres and parking lots, we lose rainforests and coral reefs.

How much longer will we agree to step aside in silence as masters of the universe turn us into property, write our contracts, rape our bodies, sell our histories? How much longer will you and I choose extinction?

We live at the cusp of an extinction event comparable in scale to the Cretaceous-Paleogene (K-Pg) extinction event 65 million years ago that killed off the dinosaurs along with some 75 percent of all life forms on the planet.² The difference is that the current event, the "sixth extinction," will not be caused by an asteroid from outer space crashing into earth. The extinction event currently taking shape on the horizon of our shared future is the product of modern industry. How shall we retain the productive horror of our civilization—and yet refuse its inevitability? One method is to notice that the "we" is not homogeneous; some have been considered more disposable than others.

More than fourteen thousand kilometers lie between the Arctic tundra and the tip of South America. American red knots make that great migration each spring on the belly of the wind. They make a critical stop at Delaware Bay, where they feast on the eggs of horseshoe crabs that are emerging from the ocean on a single day in synchronized reproduction.

Human overharvesting of horseshoe crabs, however, has threatened the food supply of these migrating birds. As a result, a multispecies coordination that has taken place over millions of years is suddenly in danger of extinction. Will they leave only ghosts? asks biologist Peter Funch.

How many kinds of time—from *longue durée* evolutionary rap-prochments to the quick boom and bust of investment capital—are wrapped up in these encounters? Minor forms of space and time merge with great ones. An extinction is a local event as well as a global one. Extinction is a breakdown of coordinations that has unintended and reverberating effects.

Some earth systems scientists describe the Anthropocene as the "Great Acceleration," the sharp rise in the destructive environmental effects of human industry since the second half of the twentieth century.³ The massive increase in carbon dioxide, methane, and nitrate emissions into the atmosphere from industrialized agriculture, mineral extraction, petroleum-driven production, and globalized shipping/transportation networks has outpaced all other rhythms of life. Yet the Great Acceleration is best understood through immersion in many small and situated rhythms. Big stories take their form from seemingly minor contingencies, asymmetrical encounters, and moments of indeterminacy. Landscapes show us.

Imagine walking through Monti Pisani in Italy, where pines and abandoned chestnut orchards mingle. Andrew Mathews offers tactics for noticing the *longue durée* of human disturbance as he shows us form, texture, color, a process of constant speculation as pattern. Ghosts become tangible through the form of ancient chestnut stools. Centuries of grafting, cultivation, trade, taxation, and disease are inscribed onto their structure and shape. The landscape emerges from ghostly entanglements: the many histories of life and death that have made these trees, this place.

Extinction Leaves Traces

To track the histories that make multispecies livability possible, it is not enough to watch lively bodies. Instead, we must wander through landscapes, where assemblages of the dead gather together with the living. In their juxtapositions, we see livability anew. Many great animals that roamed the world in the Ice Age, for example, are now extinct. Their traces are still with us. Northern trees that grow back when cut down, such as oaks, may have evolved that ability in times

Unintentional Consequences Hit Us with New Force

Industrial engineering creates many unplanned effects; what promoters intend is rarely realized. Instead of building toward a single future, many kinds of time swirl through the worlds shaped by the modern *anthropos*. These are our ghosts.

Sometimes we can see the ghosts of relentless waste and manufactured poverty in the forms of stinking garbage and leaky sewers. But there are also ghosts we cannot see and those we chose to forget. They don't sit still. They leave traces: they disturb our plans. They crack through pavements. They tell us about stretches of ancient time and contemporary layerings of time, collapsed together in landscapes.

In 1945, one technology suddenly changed the whole world: the splitting of an atom. The two atomic bombs that destroyed Hiroshima and Nagasaki, respectively, synchronized the world to radioactivity as winds carried radioisotopes around the world. Physicist and philosopher Karen Barad says these acts of war have scarred bodies and landscapes; every radiated cell is now a ghost of war. Technoscientific war changes what we know as matter, and it calls out for new analytic tools that can move us beyond what is big and small, absent or present, inside or outside. For Barad, ghosts are superpositions of past, present, and future. *Radiance* is eerie, a powerful ghost that resets planetary time. Barad invokes quantum field theory to show us haunted landscapes as *strange topologies*: "Every bit of spacetime-mattering is . . . entangled inside all others."

The synchronizations put into motion by contemporary technology—not just radioactivity but also global pollution, the movements of capital, climate change, and many more—look different when assessed from the perspective of planetary damage. They show us ghosts, the multiple stories of landscape effects. Whereas Progress trained us to keep moving forward, to look up to an apex at the end of a horizon, ghosts show us multiple unruly temporalities.

Death may not, after all, be the end of life; after death comes the strange life of ghosts. Hélène Cixous suggests that ghosts are *the* because they disturb the proper separation between life and death; they mark a "between that is tainted with strangeness."¹⁵ Such strangeness, the uncanny nature of nature, abounds in the Anthropocene, where life persists in the shadow of mass death.

Ladders Are Not the Only Kind of Time

In Europe, northern Renaissance thinkers came up with a great scheme linking classical, religious, and emergent modern thinking. They claimed that life had evolved from simple to complex. This was a grand and optimistic view that placed humans at the top of the Great Chain of Being, the highest rung of a ladder, where God had once resided. Like the Christian religious thought before it, this scheme assumed that we were all in a single time, on a single trajectory.

The storm of the Anthropocene sweeps us off the ladder into the waves of the more-than-human sea, where biologist Andreas Hejnal shows us tunicates, sponges, and jellies. Terrible and wonderful, we hardly know how to give them names. Take them off the ladder of Progress, Hejnal tells us: let them show us their complex designs. Imagine swimming among them rather than locking them into rungs on a ladder that leads only to ourselves. How many evolutionary gifts do these creatures entangle us in?

Some kinds of lives stretch beyond our ken, and for us, they also offer a ghostly radiance. The lichen that grows on tombstones is one example. Every autumn, mycologist Anne Pringle goes to the Peter-sham Cemetery near Boston to trace the outline of individual lichens, watching their growth on the gravestones of local residents and dignitaries. They grow slowly, and sometimes some disappear. Some are probably the same individuals as those that first found a place to settle when those dignitaries died centuries ago. For fleeting creatures such as ourselves, lichens are more-than-ghosts of the past and the yet-to-come.

Lichens are symbiotic assemblages of species: filamentous fungi and photosynthetic algae or cyanobacteria. Lichens are themselves a kind of landscape, enlivened by their ghosts. Many filamentous fungi are potentially immortal. This does not mean they cannot be killed; yet, unlike humans, they do not die just from age. Until cut off by injury, they spread in networks of continually renewed filaments. When we notice their tempo, rather than impose ours, they open us to the possibility of a different kind of livability.

Many kinds of time—of bacteria, fungi, algae, humans, and Western colonialism—meet on the gravestones of Petersham. The ghosts of multispecies landscapes disturb our conventional sense of time, where we measure and manage one thing leading to another. Lichens may be alive when we are gone. Lichens are ghosts that haunt us from the

past, but they also peer at us from a future without us. These temporal feats alert us that the time of modernity is not the only kind of time, and that our metronomic synchrony is not the only time that matters.

Noticing Attunes Us to Worlds Otherwise

When nineteenth-century Japanese polymath Minakata Kumagusu campaigned to maintain the local shrines that the Meiji government planned to raze, he did so both as a scientist and as a participant in local forms of knowledge. Local shrines were sites of remnant old forest, and Minakata hoped to preserve their biodiversity, including the slime molds and fungi that were subjects of his research. At the same time, he felt that folk knowledge, including stories of strange beings and eerie shadow biologies, was key to his ability to learn about nature. Rather than dismissing folk knowledge, he incorporated approaches from it into his scientific work. Indeed, while generally unacknowledged, vernacular—and even “spooky”—insights have informed some of the most important science all over the world. This is a reason to learn from ghosts, however unfamiliar their forms. Our experiments combine natural history and vernacular legacies, learning from precedents nourished by other times and places.

According to the Japanese villagers who befriended anthropologist Nils Bubandt, an ancient spirit snake lives in the geothermal vent of the mud volcano that recently destroyed their homes and livelihoods. The spirit being gives them gifts in the shape of magical stones. While difficult to find and interpret, the stones have the power to change people's luck. So villagers scour the mudflat where their homes used to be, hoping to find the gift of a better fortune in stones. To those who can divine within them the animal forms that hide within, the stones hold the promise of a better life. In a twist of irony, however, these stones are spewed from the volcano that destroyed their lives, a volcano triggered, perhaps, by oil drilling. In this devastated landscape, stones and spirits, petrochemical industry and magic, enliven each other. It is a landscape where nothing is certain. So while villagers blame the oil company for the devastating eruption of mud, geologists argue over the true and proper cause of the eruption: was it natural or anthropogenic? Is the disaster the work of geos or *anthropos*? The spirit stones in light of such undecidability urges us to see how spirits also possess geology. In troubled, illegible times, ghosts haunt us in many forms.

In the midst of disaster, stones bring a gift of hope: of fortune, of insight, of the possibility of living-with. In the Anthropocene, multiple conversations with stones are necessary. After all, the Anthropocene is a geological epoch proposed by geologists, climate chemists, and stratigraphers—scientists used to studying stones, rocks, sediments, and chemical cycles. In the Anthropocene, they suggest, humans have become a geological force. Modern industry is laying down indelible strata on the earth that will remain even after we have vanished from the surface of the planet.

To learn the stories of stones, geologists might use the insights of ethnographers and poets. In her poem “Marrow,” writer Ursula Le Guin urges us to listen to stones without forcing our will on them. Might such listening be necessary to know the Anthropocene?

There was a word inside a stone.
I tried to pry it clear,
mallet and chisel, pick and gad,
until the stone was dropping blood,
but still I could not hear
the word the stone had said.
I threw it down beside the road
among a thousand stones
and as I turned away it cried
the word aloud within my ear
and the marrow of my bones
heard, and replied.

Shimmer Still Beckons

Smothered by bad death ghosts, it seems easy to give in to inevitability or to climb belligerently up and forward. But there are other ghostly matters shimmering just below our notice. This book argues that, to survive, we need to relearn multiple forms of curiosity. Curiosity is an attunement to multispecies entanglement, complexity, and the shimmer all around us.

“Shimmer” is a gift, too, of the Yolngu people of Australia, as passed to us by Deborah Bird Rose. Shimmer is the seasonal kiss of mutually thrilling encounters among flying foxes and flowering eucalyptus trees, flying fox people, rain, and rainbows. Flying foxes spread eucalyptus pollen and seeds, allowing the trees to reproduce; they are an animal

produced from within the heart of modernity. Heroism—the story line of modern progress—is thus readable, indeed, as botulism. Livability in the Anthropocene is threatened by just those heroic story lines and practices that are thought to have made Man great.

Are there alternatives to heroism/botulism? Le Guin's essay suggests "carrier bags" as another way to tell a story. Collecting offers stories with more complex arcs of temporality, she argues; instead of a hero single-handedly making the future, there are entanglements and losses of many kinds.

Monsters are bodies tumbled into bodies; the art of telling monstrosity requires stories tumbled into stories. This is what literary critic Carla Freccero shows us through her attention to the jointly material and semiotic worlds of wolf-human relations. As she slips between literary tropes of the "lone wolf" and practices of wolf-killing forests tumble into fables tumble into politics. Material worlds and the stories we tell about them are bound up with each other. Meanwhile, biologist Andreas Hejnal shows us a dizzying range of body forms, from tapeworms to tunicates, in which each organism inherits the evolutionary solutions of its predecessors; old body plans are always mixed into contemporary ways of life. If we do not let progress "ladders" possess us, we are forced to recognize the monstrous in transformation. Classification systems are monster stories—and ghost stories—too. Nor can the question of monsters stop at the boundaries of life. An anthropogenic mud volcano, the subject of anthropologist Nils Bubandt's essay, is monstrous in just the ways we have been describing; both part of our natural connectedness and a threat to life. Spirits and stones emerge from the mud as our new synmpoietic companions: they become part of us, and they urge us, as Haraway puts it, to stay with the trouble.

In this spirit, *Arts of Living on a Damaged Planet* is itself entangled. The volume seeks to draw out, rather than to simplify or banish, monsters and ghosts. It juxtaposes many genres to show how varied storytelling styles might inform each other both in learning about our challenged planet and in forging strategies for living with others in the yet-to-come.

While this introduction uses monsters to mix up bodies, challenging the rhetorical reign of the autonomous individual, the introduction to the other half of *Arts of Living on a Damaged Planet* uses ghosts. Ghosts show the layered temporalities of living and dying

that shape our landscapes, tripping up the forward march of progress. Ghosts, like monsters, are creatures of ambivalent entanglement. The landscape assemblages of multispecies living are possible because of ghosts; modern Man's singular timelines occlude our vision. Turn this book over and follow ghosts.

As an anthropologist with a lifelong interest in the worlds salmon and humans create together, **HEATHER SWANSON** explores the globe-spanning connections and comparisons of multispecies interactions. She is an assistant professor at Aarhus University and a postdoctoral researcher with the Aarhus University Research on the Anthropocene (AURA) project. She was a 2015–2016 fellow with the "Arctic Domestication in the Era of the Anthropocene" project, funded and hosted by the Centre for Advanced Study in Oslo, Norway.

ANNA TSING conceived of the conference from which this volume grew to spin common threads of curiosity across natural science, humanities, arts, and social science. She is a professor of anthropology at the University of California, Santa Cruz, and a Niels Bohr Professor with Aarhus University Research on the Anthropocene (AURA). Her most recent book, *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins*, received the Gregory Bateson Prize and the Victor Turner Prize in Ethnographic Writing.

An anthropologist, **NILS BUBANDT** is professor at Aarhus University. He is a co-convenor of Aarhus University Research on the Anthropocene (AURA), with Anna Tsing, and editor in chief of the journal *Ethnos*, with Mark Graham. In his book *The Empty Seashell: Witchcraft and Doubt on an Indonesian Island*, he explores the relationship between monstrosity and uncertainty. He also takes plane rides to conferences about the Anthropocene with a certain amount of ambivalence.

ELAINE GAN makes clocks and time machines as speculative devices for sensing and mapping worlds otherwise. Working at the intersection of digital arts, environmental anthropology, and science and

wind in the trees. Rose describes their coordinations through the Yolngu term *bir'yun*—a shimmering into brilliance. *Bir'yun* attends to temporal patterns that emerge from more-than-human shimmerings and dreamings—pulses of ancestral power, of life riding a wave that is always coming: “*bir'yun* shows us that the world is not composed of gears and cogs but of multifaceted, multispecies relations and pulses.”

Landscapes shimmer when they gather rhythms shared across varied forms of life. *Shimmer* describes the coming in and out of focus of multispecies knots, with their cascading effects. Yolngu cosmologies inform us; juxtaposed with the stories made available from many arts and sciences, vernacular and academic, we learn the liveliness of landscapes. Landscapes enact more-than-human rhythms. To follow these rhythms, we need new histories and descriptions, crossing the sciences and humanities.

As artists, we conjure magical figures, weave speculative fictions, animate feral and partial connections. We necessarily stumble. And try again. With every mark, difference haunts and struggles to appear anew.

Postcolonial historian Dipesh Chakrabarty points out that consideration of humanity as a geological force troubles the distinction between natural and human history, forcing us into a new kind of historicity.⁶ The deep time of geology, climate, and natural science is collapsing into the historical time of human technology. *Anthropos* has become an overwhelming force that can build and destroy, birth and kill all others on the planet. In the new histories and politics that we must form—and as the contributions to *Arts of Living on a Damaged Planet* demonstrate—we must share space with the ghostly contours of a stone, the radioactivity of a fingerprint, the eggs of a horseshoe crab, a wild bat pollinator, an absent wildflower in a meadow, a lichen on a tombstone, a tomato growing in an abandoned car tire. It is these shared spaces, or what we call haunted landscapes, that relentlessly trouble the narratives of Progress, and urge us to radically imagine worlds that are possible because they are already here.

Anthropocene: a time when survival teeters on a question stirring in the marrow of the Earth's bones. What kinds of human disturbances can life on Earth bear? By showing us Progress and Extinction—life's historical entanglement with death in ruined landscapes—ghosts point the way in this half of *Arts of Living on a Damaged Planet*. Turn the book over and follow monsters.