Introduction
On the Poetics and Ethics of Scale

In 2013, French-Swiss artist Julian Charrière orchestrated an encounter between the microscopic inhabitants of the world's most famous rivers. Combining samples from ten major rivers, including the Danube, the Mekong, and the Mississippi, Charrière invited the microorganisms present in the water to meet on the surface of his sculptures. Each sculpture was a construction of small bricks, whose composition – plaster, fructose, and lactose – encouraged microscopic life to thrive. The resulting artwork, *Somehow, They Never Stop Doing What They Always Did*, is a collection of slowly decomposing towers and pyramids – shapes designed to evoke 'mythological towers' and 'architectural archetypes like the Tower of Babel'.[1] Sheltered by glass cases, their surfaces are gradually transformed by bacteria and mould. The towers are both strange and familiar landscapes: they are produced by human hands, but redesigned by microbial architects.

Somehow invites the viewer to engage with multi-scalar life. As an apparatus, it reveals physical and temporal scales that are usually invisible: microbes and fungi are staged as the main agents of growth and decomposition, and mineral erosion is accelerated by sugar so that it becomes a visible process. Viewed as metaphors, the architectural shapes recall the decline of human civilisations, as if miniature Mayan pyramids were eroding before us. Viewed as synecdoche, the microorganisms they host represent the largest rivers in the world and the species they contain. Through an imaginary microscope, we can imagine them cohabiting with unfamiliar neighbours from other rivers, until what appears as a whole on one scale resolves into an ensemble of discordant parts on another. If we change the scale again, and think of the artwork at the molecular level of metabolic energy production, then the carbohydrates contained in the setting itself are the key actors of this performance. Each

[1] Charrière, 'Somehow'.

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time we select a new lens for our imaginary microscope, agency shifts, and distinctions between actors and landscape dissolve or solidify. But are these words, 'actors' or 'landscape', even appropriate? The terms I have used highlight the problematic role of figurative thought: it is tempting to approach unfamiliar scales through analogies with familiar ones – to view, here, space as landscape, microbial time as human time, and organic decay as a metaphor for civilisational decline. Yet if the artwork is to enable a trans-scalar encounter between human and microscopic life, then allegorical thought itself may be an obstacle – an easy analogy that erases the otherness of the nonhuman scale.

Figurative poetics do epistemic work. Metaphor and synecdoche abound not only in artistic explorations of living processes but also in scientific theory, and particularly in the popular science that conveys biology and ecology to the general public. In *The Origin of Species* (1859), Charles Darwin wrote of an 'inextricable web of affinities' linking living forms, and pictured the struggle and profusion of life as a 'tangled bank'.[2] Those metaphors, as Gillian Beer has shown, drew on the widespread use of woven fabric imagery in Victorian culture.[3] In *The Variations of Animals and Plants under Domestication* (1868), Darwin used a synecdoche to describe multi cellular life: 'each living creature', he suggested, 'must be looked at as a microcosm – a little universe, formed of a host of self-propagating organisms'.[4] In the popular science of the early twenty-first century, we find Darwin's tropes renewed. The image of entanglement has derived fresh energy from microbiology and postgenomic science, which connect health and biological development to inner and outer environments. Ecological and biomedical research have highlighted the interconnections and feedback loops linking living processes on different scales.[5] Accumulating evidence of environmental degradation, species extinction, and disruption of the Earth system has driven home the inseparability of human systems and ecosystems, which are connected by the concept of 'One Health'.[6] In the humanities as well as in the biological sciences, conceptions of human life are shifting to integrate complex relations of dependency with micro- and macroscopic forms and

[2] Darwin, *Origin*, p. 429. [3] Beer, *Darwin's Plots*, p. 156. [4] Darwin, *Variations*, vol. 2, p. 204.
[5] Derek Woods notes that 'the word "feedback" appears more than a thousand times in the 1552-page IPCC [Intergovernmental Panel on Climate Change] report published in 2013' ('Genre at Earth Magnitude', p. 1153).
[6] The 'One Health' initiative was launched in 2008 by the Food and Agriculture Organization of the United Nations, the World Organization for Animal Health, and the World Health Organization.

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systems of life. These range from the invisibly small scales of the virus or the microbiome to the vast – and equally invisible – scales of the biosphere and the Critical Zone, that very thin layer of the planet's soil and atmosphere in which life is possible. Looking inwards, we increasingly look outwards, as we now know that only a minority of cells within the human body contain a human genome. 'My body', as poet Adam Dickinson humorously summarises, 'is a spaceship designed to optimize the proliferation and growth of its microbial cosmonauts'.[7]

Whether we view our bodies as microcosms, as spaceships, or as nation-states defending themselves against invading parasites, these multi-scalar poetics are shaping our century's growing awareness of entangled biologies. As a metaphor for biological interdependence, the notion of entanglement has become a cliché of twenty-first-century environmental rhetoric. Its widespread use stems from the ecofeminist strand of late twentieth-century environmental discourse,[8] as well as from the success of popular science works such as Fritjof Capra's *The Web of Life* (1996), which identified a paradigm shift in ecological thought towards a systemic view of life as 'networks within networks'.[9] Capra anchored his analysis in the philosophy of deep ecology that attempted, in the 1970s, to move away from anthropocentrism, but he extended this philosophy through systems biology, the science of complexity, and chaos theory. Arguing that the ecological crisis was a 'crisis of perception', he defended systems thinking as a shift 'from the parts to the whole' with far-reaching ethical consequences.[10] Whereas Capra included biological, social, and psychological phenomena in this web, many early twenty-first -century works use the entanglement metaphor to describe a specifically biological paradigm of interdependence. Carl Zimmer's *The Tangled Bank: An Introduction to Evolution* (2009) revives Darwin's words as a metaphor for evolutionary interdependence. In David Quammen's *The Tangled Tree: A Radical New History of Life* (2019), the 'tangle' describes the extent of lateral gene transfer and surprising evolutionary connections revealed by molecular genetics. In Martin Sheldrake's *Entangled Life: How Fungi Make Our Worlds, Change Our Minds, and*

[7] Dickinson, *Anatomic*, p. 42.

[8] In 1962, Rachel Carson's influential *Silent Spring* placed Darwin's image of the web of life at the centre of ecological rhetoric. In 1988, Donna Haraway defended the need for multiple, situated knowledges whose 'webbed accounts' would replace 'master theory' ('Situated Knowledges', p. 588). Catriona Sandilands notes that by the end of the twentieth century weaving had become a 'faithful ecofeminist verb' (*Good-Natured Feminist*, p. xix).

[9] Capra, *Web of Life*, p. 35. [10] Capra, *Web of Life*, pp. 4, 17.

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Shape Our Futures (2020), entanglement describes fungal ecologies and their crucial role for plant life. I use the expression 'entangled life' to signal this context as a matrix both for the poetics I analyse and for the way readers will interpret these poetics. As a title for my study, the term also acknowledges the key figurative role of knots, webs, and tangles in recent environmental humanities, particularly Donna Haraway's attempts to connect the living via 'string figures', Timothy Morton's ecological 'mesh', Tim Ingold's studies of landscapes as tangled 'lifelines', and Anna Tsing's call for 'an alternative politics of more-than-human entanglements'.[11] These figures are not identical to Capra's: whereas *The Web of Life* founded a philosophy of entanglement in deep ecology's 'expansion of the self all the way to the identification with nature',[12] environmental and biomedical philosophy in the first two decades of the twenty-first century tended to register a sense of estrangement and shared vulnerability, brought about by Anthropocene awareness, genomics, and microbiology. Entanglement, in other words, is less a stable concept than a structuring schema in our current imagination of life.[13]

Because the twenty-first century's episteme of biological entanglement goes hand in hand with a sense of widespread vulnerability, the epistemic work performed by the poetics of scale is inherently political. In 2020, the Covid-19 pandemic forcibly reminded us of our inner cohabitants, and of the intricate connections that link anthropogenic ecological damage to the evolution of our microscopic parasites. Here, too, inherited poetics are at work within scientific rhetoric: the word *parasite* is a metaphor, a term which described a type of character in classical Greek and Roman theatre, and only entered our biological vocabulary in the nineteenth century. In the twentieth century, biological parasitism was allegorised as a social category by nationalist ideologies, leading to the infamous branding of Jews as parasites in Nazi discourse. In other words, when twenty-first-century politicians blame infections on foreigners, they draw upon two centuries of metaphorical parasitism – two centuries during which the concept has shifted back and forth between artistic, scientific, and political discourse. This book argues that fiction plays a unique role within this kind of discursive matrix, as a narrative medium which

[11] Haraway, *Staying with the Trouble*, p. 3; Morton, 'Thinking Ecology', pp. 195–223; Ingold, 'Bindings'; Tsing, *Mushroom*, p. 135.
[12] Capra, *Web of Life*, p. 12.
[13] I borrow this term from Fernand Hallyn, who argues that the rhetoric of scientific discovery relies on tropological and narrative operations that produce recurrent poetic schemata (*Structures rhétoriques*, pp. 12–13).

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highlights and questions such rhetorical strategies. Novels such as Greg Bear's *Darwin's Radio* (1999), Alexis Wright's *The Swan Book* (2013), and Ali Smith's *Summer* (2020) use viruses to question the political rhetoric of contamination and containment. This fiction explores not only the ontological shifts demanded by contemporary microbiology but also the ideological conception of society as a body that needs defending, and the ethical demands of ecology on a planetary scale. These stories are interventions in the emergent *symbiopolitics* of the twenty-first century.

I.1 Twenty-First-Century Fiction as a Connector of Scales

The underlying hypothesis of this study is that fiction may act as a sensing instrument which helps us to perceive other scales of life, at a time when biological vulnerability and ecological responsibility make this perception urgent. When Darwin described the beauty of co-evolved life forms as a tangled bank, his description contained only life forms that are visible to the human eye – birds, plants, insects, and worms. But the early twenty-first century's awareness of biological entanglement requires an imaginative grasp of scales beyond human perception. To understand this epistemic shift, we need to frame it within two 'turns' that have received much commentary in the first two decades of this century: the planetary and the microbial. The planetary turn reframes local questions within the planet as (eco)system, a concept that does not necessarily match the globe of globalisation. The microbial turn views microbial life as the main force of evolution and the cornerstone of ecosystems.[14] Attributing an epistemic shift to any particular century is of course suspiciously neat. Planetarity as a philosophical concept, while often connected to Gayatri Chakravorty Spivak's 1999 essay *Imperatives to Reimagine the Planet*,[15] has roots in twentieth-century environmental movements. And the origins of the microbial turn may be traced back to the game-changing work carried out by microbiologist Lynn Margulis in the 1960s and 1970s. But the early twenty-first century has seen a marked acceleration of these epistemic shifts towards vast and minute scales. In 2000, atmospheric chemist Paul Crutzen declared that the stability of the Holocene had given way to the anthropogenic disturbances of the 'Anthropocene', paving the way for a new, troubled relationship to both species and planet.[16] In 2001, microbiologist Joshua Lederberg

[14] Herbrechter, 'Microbes', pp. 354–66.
[15] Elias and Moraru, *Planetary Turn*, pp. xi–xxxvii.
[16] Crutzen, 'Geology of Mankind', p. 23.

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popularised the term 'microbiome' to refer to the genomes of microbial communities, a field of research that is currently transforming many areas of science.[17] After the first sequencing of a human genome was completed in 2003, the Human Microbiome Project was launched in 2007, and both stimulated what scholars have called a 'molecularisation' of biology and bioeconomics.[18] Together, the planetary turn and the microbial turn make multi-scalar awareness an urgent epistemic challenge.

This book shows that a significant strand of anglophone fiction is intervening in that epistemic shift, by connecting the meso-scale of human existence to the microscopic and macroscopic scales of ecological entanglements. The novel, I suggest, is as much a technology of scale as microscopes or landscape paintings are – and by 'technology' I refer here to an instrument accompanied by a set of practices, from the Greek meaning of *techne* as both art and practice. My claim is in step with the current framing, across the environmental humanities, of narrative as an epistemic tool. This includes Donna Haraway's call to 'change the story' in environmental humanities, Bruno Latour's call to welcome new nonhuman 'actors' in ecopolitical philosophy, and anthropologists Anna Tsing's and Tim Ingold's emphasis on the specific capacity of narrative to capture a processual view of the world. While I agree with those epistemic claims for narrative, I suggest that narrative *fiction* has a unique heuristic capacity that gives it an important ethical role to play in this shift. Fiction's poetics of attention, as Jean-Michel Ganteau has argued, not only represents but elicits an ethics of attention, leading the reader 'to experience and *perform* attentional experiences in turn'.[19] Building on that hypothesis, my study highlights fiction's heuristic ability to explore the ethical stakes of entanglement between different scales of life. This potential is linked to the novel's capacity for complex focalisation, its deployment through time, and its long-standing commitment to synecdochic and allegorical poetics, which makes it a form particularly well-suited to questioning relations among scales.[20] As an exercise in focalisation, fiction can produce the reversals of perspective demanded by ecologists and microbiologists,

[17] For a discussion of the origins of the word microbiome, see Prescott, 'History of Medicine', pp. 24–5.

[18] Rose, *Politics*, p. 15. [19] Ganteau, *Poetics and Ethics*, p. 171.

[20] While the heuristic potential of these combined formal characteristics is specific to the novel, the argument I develop here about fiction is comparable to Ada Smailbegović's *Poetics of Liveliness*, which views poetry as an 'instrument of amplification, rendering perceptible material scales that would otherwise escape the limitations of unaided human sensation' (p. 7).

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and the multiplication of perspectives needed to face the current ecological crisis. Narrative fiction's commitment to temporal development, moreover, allows it to explore diachronic relations between different scales, and thereby to problematise and politicise scalar poetics. Like popular science and environmental discourse, the novels and short stories presented here use metaphors, synecdoche, and allegory to structure relations between scales. But their use of such figures is markedly critical, underwriting the poetics of scale with histories of capitalism, colonisation, climate change, forced displacement, and ecological damage. Under this critical pressure, figurative poetics behave unexpectedly, cracking and morphing into new rhetorical forms. Fiction, then, is a scalar viewing instrument, but one which opens up lines of fracture in the multi-scalar perspective. Along these fault lines, points of contact between scales become ethical sites where relations to environments, communities, and other species come into focus.

The multi-scalar perspective affects our conception of the human subject, our division of the environment into objects, and the very distinction between subject and environment. Through multi-scalar poetics, fiction therefore puts pressure on a number of inherited narrative categories. The concept of setting is weakened when environments are no longer distinguishable from the life forms that constitute them. The idea of human action is troubled when agency becomes a multi-scalar property that is not bound to organisms. The perception of character changes fundamentally when entire species are the actants of a novel's plot, or when each species turns out to be a Russian doll of nested species. The structure of this book highlights this troubling and redefining of narrative categories by focusing on five shifts in the fiction under study: the perception of landscape as a living, active mesh; the redistribution of agency across scales; the narration of encounters with other-than-humans as trans-scalar events; the troubling of the human self by its symbiotic others; and the discordant juxtaposition of different scale-bound focalisations. Through these successive angles, I suggest that fiction acts as a corrosive space for our conceptions of self, agency, and environment, and as a heuristic space for new versions of these concepts.

I.2 Scale Theory and the Epistemic Role of Figurative Rhetoric

The 2010s and early 2020s have seen a growing number of scale-related inquiries in the humanities, particularly in media, science and technology, and environmental studies. Several resulting concepts are illuminating

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for the poetics I examine. Within the humanities, definitions often diverge over the question of whether scale is an ontological feature or an epistemological construct. Rhetorician Joshua DiCaglio proposes that scale is 'not a percept but a concept' which 'uses a measure to provide a conceptual relation between two perceptions'.[21] Media studies scholar Zachary Horton also emphasises that scale names a set of relations: he points out that size is 'absolute and subject to direct measurement by the physicist', whereas scale is 'relative' and 'reflexive'.[22] But Horton argues that an ontological dimension is nevertheless inherent to the concept of scale: scale marks both 'ontological difference that is independent of experience' and 'arbitrary domains generated by experiential accounts'.[23] It is in fact essential, in Horton's account, to acknowledge the structuring tension between *scale as ontological difference* – a view derived from physics where planet, bacteria, and humans each occupy a certain scale – and *scale as a construct of knowledge*, if we are to understand the ethics and political tactics involved in scale discourse and scalar poetics.

I follow Horton's definition of scale as both ontological and epistemological, and therefore as an inherently problematic concept, which throws into stark relief the rhetorical mediations necessary for us to perceive other scales of life. My analysis demonstrates that certain tropes and narrative structures have become crucial mediators of other-than-human biological scales. It is my contention that literary form performs epistemic work, through poetics that simultaneously *figure* and *trouble* relations between scales. My argument draws on recent work carried out by scholars in literature and culture who have problematised individual multi-scalar tropes. Figures relying on analogy, such as metaphor and allegory, have received most critical attention. I have been inspired by Susan Squier's reading of epigenetic metaphors and by Anita Girvan's analysis of the carbon footprint trope, which draws on Jacques Rancière's politics of aesthetics to present ecological figures as mediators for larger-than-human relations, potentially '*re-distributing the sensible* such that "newcomers" appear'.[24] As Squier argues, figurative language can draw the reader into a complex conceptual space which functions 'kinetically, affectively, and methodologically, as well as epistemologically'.[25] A figure may thus function as a particular kind of model which shapes perception and understanding in affective as well as

[21] DiCaglio, *Scale Theory*, p. 30.
[22] Horton, *Cosmic Zoom*, p. 16.
[23] Horton, *Cosmic Zoom*, p. 11.
[24] Girvan, *Carbon Footprints*, pp. 56–7.
[25] Squier, *Epigenetic Landscapes*, p. 16.

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epistemic ways. This figurative modelling is also what Ursula Heise examines in her critique of allegories of the global, where she highlights the problematic tendency of images such as 'Spaceship Earth' or the Earth as 'Blue Marble' to foreground 'synthesis, holism and connectedness'.[26] Like Heise, I am interested in alternative forms 'that resist any direct summing up of parts into wholes or any simple foregrounding of connectedness at the expense of disjunction and heterogeneity'.[27]

Analogies between scales are in fact consistently questioned by both cultural theorists and scale theorists. Prominent thinkers in this emergent *scale critique* all express a distrust of what Horton calls 'scalar collapse', practices that 'normalize one scale to the dynamics, features, and cultural status of another'.[28] Ecocritics and communication scholars are increasingly identifying analogies as epistemic and ethical barriers because understanding one scale through another prevents us from perceiving *scale effects*, the changes that occur when we consider a situation at a different scale. Since the Anthropocene, as Timothy Clark suggests, is in itself one huge scale effect, finding non-analogical tools for representing other scales has become critical.[29] This problematisation of analogy has far-reaching consequences for multi-scalar poetics: if metaphor, as Lakoff famously theorised, remains one of our dominant modes of cross-domain mapping, then how can the novel work with this mode without erasing the epistemic challenge of scale-change, including the scale effects of human behaviour in the Anthropocene?[30] Can fiction propose alternative modes of cognitive mapping, through figures that do not reduce mereological relation – the relation between part and whole – to a relation of identity? In Chapter 1, I examine the rhetorical context of multi-scalar discourse in contemporary theory and culture, and identify some of the recurrent tropes that structure our imagination of other scales. In the rest of the book, I outline the critical role that fiction is playing in this discursive field.

Seeking out the recurrent figures and narrative structures that connect different scales of life, I find that analogical tropes are inevitable but problematic tools for contemporary fiction.[31] Metaphors inherited from

[26] Heise, *Sense of Place*, p. 63. [27] Heise, *Sense of Place*, p. 64.

[28] Horton, *Cosmic Zoom*, p. 11. Narratologist Marco Caracciolo analyses this erasure of scale variance through the cognitive concept of *isomorphic projection*, 'a perspective on the nonhuman that collapses it into the human by presupposing their isomorphism or equivalence' (*Narrating the Mesh*, p. 160).

[29] Clark, *Ecocriticism*, p. 72. [30] Lakoff, 'Contemporary Theory of Metaphor', pp. 202–51.

[31] My designation of metaphor and allegory as analogical tropes follows the definition of metaphor as a substitution that suggests a 'common quality' between a tenor and a vehicle, and the

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Renaissance poetics, such as the body-as-landscape or the landscape-as-body, are still ubiquitous in twenty-first-century environmental and biomedical narratives. Allegory, because it invites switching between different levels of reading, is one of the most frequent means of connecting different scales. In this study, I use the term to refer to two kinds of shift in scale. Allegorical *figures* point to concepts or features behind individuals: the Earth system figured as the goddess Gaia is one instance that has become particularly significant in contemporary philosophy, and which is ironised in recent fiction by T. C. Boyle, Jeanette Winterson, and Jeff VanderMeer. Allegorical *narratives* invite a shift in focus which is often a shift in scale: a fictional character may, for instance, represent humanity, or a plot involving individuals might condense events occurring on the scale of a nation or planet.[32] When it extends beyond isolated figures, allegorical *reading* becomes an exercise in thinking beyond the scale of the sentence or paragraph, as well as beyond isolated events or characters, for 'a large-scale exposition in which problems are conceptualized and analysed into their constituent parts'.[33]

Allegorical reading has accordingly become an essential part of ecocriticism, where plot is often transposed to a planetary, or at least ecosystemic, level and characters are viewed as representatives of humanity or of groups with conflicting interests. In a study of allegory in Caribbean and Pacific Islands literature, Elizabeth DeLoughrey proposes that 'allegory is the fundamental rhetorical mode for figuring the planet as well as the historical rift between part and whole that is symbolized by the Anthropocene'.[34] This statement strengthens a critical consensus since many of the novels that I present in this book, including Richard Powers's *The Overstory* (2018), Jeanette Winterson's *The Stone Gods* (2007), and David Mitchell's *The Bone Clocks* (2014), have been read as Anthropocene allegories. Allegory's potential for scale-switching is also attracting interest in studies of multi-species narration: David Herman, for instance, theorises it as a key mode for storytelling 'at species scale',[35] because allegorical projection, which sees a species or population behind an individual being, helps readers to connect meso- and macro-levels of

understanding of allegory as an 'extended' metaphor (Baldick, *Oxford Concise Dictionary of Literary Terms*, pp. 153, 5).

[32] I follow the definition of allegory as either 'a personification, whereby abstract qualities are given human shape' or 'a continuous parallel between two (or more) levels of meaning in a story' (Baldick, *Oxford Concise Dictionary of Literary Terms*, pp. 5–6).

[33] Childs and Fowler, 'Allegory', p. 4.

[34] DeLoughrey, *Allegories*, p. 18.

[35] Herman, *Narratology*, p. 249.

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life. My study, however, foregrounds fiction's resistance to allegory's erasure of disjunctions and heterogeneity between scales. In the case studies I present, widespread tropes like the microcosm and the footprint are put under pressure by historical awareness and ethical questioning. Allegorical figures become disjunctive, marked by the divergence between individual and species, local and planetary environments. Such poetics turn multi-scalar tropes into sites of ontological disturbance, as well as of response-ability. This ethical questioning is carried out on the stylistic level of poetics and figurative thought, but also through contrasting focalisations and multiple perspectives. Many of the novels I examine highlight ecologically harmful scale effects, but these are often perceptible to one set of characters only, or even to the reader alone. In the most satirical strand of ecofiction, represented in this book by Margaret Atwood, T. C. Boyle, and Ali Smith, focalisers tend to be completely blind to the scale effects of their own lifestyle. The satirical energy of these narratives lies precisely in this blindness.

I.3 The Ecopolitics and Symbiopolitics of Multi-scalar Poetics

What is at stake in the poetics of scale? Every time we switch from one scale to another, what seemed separate merges into new wholes, and what seemed whole dissolves into new parts. A microscopic examination of my skin may disaggregate it into cells while also revealing the microbes or pollutants that implicate it in vaster ecological relations. Throughout this book, I view narrative fiction as a key player in this century's multi-scalar rhetoric because it construes the perception of other scales as an ethical relation. Stories that connect the human to other-than-human scales open up the question of response-ability towards other life forms, as well as towards the ecosystems that sustain all life forms.

A good way of grasping the ethical potential of multi-scalar poetics is to consider how changes of *scale* may extend the *scope* of human concern. It is difficult, as DiCaglio remarks, to truly look beyond the human because we often speak of 'scaling up' in economics or politics without actually extending the scope of our concern:

> The conceptual limitation of our scope of consideration to the human has conflicted directly with the actual change in scale to the planetary that has occurred in practice, perpetuating the neglect that produces the cross-scale disruption of mass extinction, global warming, and widespread pollution. [. . .] Human relations need to be subsumed into ecological relations

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> (as another aspect of ecological relations) alongside the aggregate relations of forests, animal populations, microbial accumulations, fungal networks, and so on.[36]

Here, DiCaglio highlights the ecopolitical potential of a shift to the planetary scale, and simply includes the microbial in this perspective. Similarly, Clark's ecocritical studies tend to focus on the planetary scales of the Anthropocene and of the global ecological crisis. I will emphasise, however, the equal ethical importance of shifts towards macroscopic *and* microscopic scales. James Lovelock's formulation of the Gaia hypothesis and Bruno Latour's subsequent theorisations of the Critical Zone were made possible only by Lynn Margulis's work on microbial communities and on the symbiotic interdependence among different scales of life. This reminder is essential for us to understand the role of biological awareness in contemporary ecological sensitivities and the complex composition of what DiCaglio calls the 'diffused intimacy of the ecological', as well as, conversely, the shaping of new biological identities by ecological anxieties.[37] Twenty-first-century environmental thought, bioethics, and philosophies of the subject are informed by this double scale shift, towards the invisibly small as well as the ungraspably huge.

Ecological response-ability is thus a challenge that is intimately bound up with scale, but not only with the scale of the planetary. This challenge requires attentiveness to invisible scales both vast and minute, and to the discrepancies between disparate timescales – including those not only of climate change but of genetic transfer and microbial evolution. Attentiveness to other scales is an exercise in temporality as much as in spatial imagination. In this regard, Rob Nixon's scale-sensitive definition of environmental violence is exemplary in the way that it binds speed, attention, and ethics into a delicate configuration: slow violence, he suggests, is a form of 'calamities that patiently dispense their devastation while remaining outside our flickering attention spans'.[38] Stories that render perceptible the slow change of ecosystems, or the rapid evolution of microbial populations, may thus bring into focus the vulnerabilities that play out at different scales and the responsibility of human life within these interdependent scales. The fiction I examine in this book experiments with such multi-scalar attention, but does not necessarily attribute it to fictional characters. In some cases, characters are intensely aware of the biological processes surrounding and

[36] DiCaglio, *Scale Theory*, pp. 44–5.
[37] DiCaglio, *Scale Theory*, p. 6.
[38] Nixon, *Slow Violence*, p. 6.

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traversing them: for the scientists in T. C. Boyle's *The Terranauts* (2016), every breath brings awareness of 'mold, spores, damp earth, process, the ants and termites and microbes in the soil breaking things down' (81). But fiction also experiments with attention beyond and against its characters. Ali Smith's *Winter* (2017) portrays a staunch defender of global capitalism who is haunted by a miniature, floating blue-green planet in the corner of her eye. Through such strategies, narrative focalisation can both mock our inability to grasp other scales and form our intimacy with them.

Extending attention to the microscopic as well as the macroscopic brings into focus the extent to which this century's ecopolitics must be *symbiopolitics*. Stefan Helmreich suggests that this term describes the 'densely political relations between many entangled living things – not just microbial – at many scales [. . .] coexisting, incorporating, and mixing with one another'.[39] By combining biopolitics with symbiosis, this neologism draws attention to the fact that biological discourse is bound up with the socio-politics of its time, including discourses about race, gender, and national identity. My analysis of multi-scalar rhetoric is inspired by a number of thinkers who, like Helmreich, approach discourse as a site of contemporary biopolitics. These include philosophers of immunity such as Roberto Esposito, who engage in 'historicizing and denaturalizing the rhetoric of immunity',[40] and rhetoricians of biomedicine such as Lisa Keränen, who track 'the close coupling of discourses of disease with those of national security'.[41] Multi-scalar rhetoric thus structures a discursive field that is much broader than that of the novel, but the novel's long history of synecdochic and allegorical representation places it in a unique position to put pressure on such figures, and to unfold their symbiopolitics. Such pressure sites, I suggest, are where fiction positions itself as a site of trans-scalar ethics.

I.4 Scale-Switching as Writing and Reading Practice

In an influential study, Mark McGurl argues that certain types of story are more suited than others to making the 'vastness and numerousness of the nonhuman world' visible, 'as a formal, representational, and finally existential problem'.[42] Looking back at the twentieth century, McGurl notes that while science fiction, horror, and weird fiction have generally been tasked with engaging with larger nonhuman scales, the realist short

[39] Helmreich, '*Homo microbis*', p. 56. [40] Bernard, 'Vibrant Allegories', p. 16.
[41] Keränen, 'Biosecurity', p. 231. [42] McGurl, 'Posthuman Comedy', p. 537.

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story may be particularly well suited to engaging with microscopic multitudes and '*[o]ur utter undermining by the small*'.[43] However, the case studies I have gathered here represent a diversity of lengths and genres, including realist fiction, weird fiction, and science fiction. All are works of fiction written in English between 1999 and 2017, all express ecological concerns, and many are structured by biological concepts, so that they could all be labelled ecofiction or biofiction, or both. While no single genre stands out, the most striking trait of this corpus is the pressure it exerts on the realist mode. Trans-scalar relations tend to be narrated either through speculative fiction – a type of story which is openly heuristic and presents itself to the reader as a thought experiment – or through realist fiction which often twists away from the constraints of realism precisely at the moments when it explores points of contact between scales. McGurl's emphasis on the scalar potential of non-realist modes thus remains relevant because other-than-human scales tend to be figured as uncanny, otherwordly, or surreal presences that disturb the realist mode.

The studies I propose do not group texts according to their themes or to their national or geographical contexts. Instead, I choose to analyse multi-scalar poetics through the five main narrative categories that are destabilised by these poetics: setting, agency, encounter, self, and focalisation. Wright's *The Swan Book* (2013) and Silko's *Gardens in the Dunes* (1999) could be read together as decolonial writing that historicises and politicises scalar relations. But reading Silko's novel with Byatt's story 'A Stone Woman' (2003) allows me to examine a disturbance in the concept of landscape that is both contemporary *and* historically rooted, for Silko, in Indigenous science. This parallel reminds us how much Indigenous conceptions of land anticipate many of the concepts we attribute to Anthropocene theory. While both stories are marked by the late twentieth century's rising ecological anxiety, Silko anchors this anxiety in the catastrophic rewriting of landscape by nineteenth-century American settler capitalism. Reading Silko's and Byatt's texts alongside Ghosh's novel *The Hungry Tide* (2004) reveals that the microcosm functioned as a key figure in anglophone ecofiction's relation to landscape at the turn of the twenty-first century, crystallising disjunctive relations between part and whole and between local and global scales.

Through close readings that are attentive to the detail of sentence syntax as well as to overarching plot structure, I ask what epistemic and ethical

[43] McGurl, 'Posthuman Comedy', p. 552. Italics in original.

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work is performed by these stories' recurrent figures and narrative devices. Scale-switching is not only a writing practice in the corpus under study but also the reading methodology which is best suited to elucidating fiction's relation to the cultural context of multi-scalar rhetoric. Reading figurative language within the dynamics of narrative draws attention to fiction's capacity to elaborate a figure, carrying out a prolonged form of cognitive mapping, and to put pressure on it. Narrative can thus question readerly expectations – expectations, for instance, of synecdochic relation between characters and social groups, or of allegorical patterns where the plot modelises a broader conflict. Indeed, scale-switching is fundamental to allegorical reading as a form of problem-reading, a model of reading which contemporary fiction questions.

Writing and reading as scale-switching practices contribute to the 'scalar dislocation' performed by posthumanist philosophy, where networks and shared materialities dissolve boundaries between humans and environments.[44] My study resonates particularly with Stacy Alaimo's definition of posthumanist environmentalism as an ethics 'that refuses to see the delineated shape of the human as distinct from the background of nature'.[45] One of the aims of this book is to establish the extent to which fiction's multi-scalar aesthetics constitute a resistance to anthropocentric and anthropomorphic assumptions, and thus answer posthumanism's call for non-projective modes of representation. I focus particularly on fiction's capacity to trouble the epistemological colonisation that Horton calls *pan-scalar humanism*, 'a tradition that tames the alterity of different scales by relativizing it, binding unfamiliar scales to the familiar ones of the human'.[46] But narrative forms that enable us to read one scale through another persist, and this persistence makes fiction a particularly significant space of investigation into scale – a space that questions our epistemological and ethical relations to other scales of life, but that does so *within the constraints* of analogical thought, acknowledging its resilience while pushing against its boundaries.

I suggest then that a mereological mode of reading, attentive to relations between part and whole, is necessary to grasp this fiction's intervention in contemporary biopolitics and ecopolitics. This mode

[44] DiCaglio, *Scale Theory*, p. 123. Concepts such as Timothy Morton's hyperobjects and Stacy Alaimo's trans-corporeality can be viewed as attempts to grasp this double shift towards the micro and the macro. See Morton's *Hyperobjects*; Alaimo's *Bodily Natures*; and Woods's comparative reading of these concepts in 'Scales: Climate versus Embodiment'.

[45] Alaimo, *Bodily Natures*, p. 142. [46] Horton, *Cosmic Zoom*, p. 3.

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of reading is timely for readers of twenty-first-century fiction because the microbial and planetary turns render mereological relations problematic. Who am I if I contain trillions of other living organisms? How can I identify with the species that has damaged the planet? This mereological line of questioning is visible in contemporary fiction's multiscalar poetics, but is also provided by the reader. Readers of this century are likely to bring to the novel an uncomfortable awareness of problematic scalar relations: both an ecological sense of discrepancies between individual action and species agency and a biological awareness of otherness within the human body. In practice, a mereological mode of reading entails both relating the small scale of sentence to the macroscale of plot and paying attention to those rhetorical moves that connect different scales of life. These moves are present in the text, but their full realisation depends on the act of reading. I subscribe to Gary Johnson's description of allegory as a form that 'emerges from a complex interaction among authorial intention, the nature of the narrative text in question, the rhetorical situation that gave rise to that text, and the reader's response to it'.[47] I suggest that this model of complex interaction also applies to the three rhetorical structures that my study highlights: synecdoche, metalepsis, and irony.

I.5 Synecdoche, Metalepsis, and Irony

This book identifies three narrative tools that allow critical tension to subsist between represented scales, and thus between part and whole, individual and species, microcosms and macrocosms. I find that contemporary fiction uses synecdoche, metalepsis, and irony to explore the paradoxical awareness of scale demanded by the early twenty-first century's ecological predicament: an awareness enabled by heuristic substitutions and intrusions of one scale upon another, yet predicated on disjunctions between scale domains. I do not suggest that analogical tropes have disappeared; they continue to connect the individual story to that of the species, inner to outer ecosystems, and the local space to the global.[48] But I find that synecdochic tensions, metaleptic leaps, and ironic *décalage* perform vital work alongside and within such analogical readings.

[47] Johnson, *Vitality of Allegory*, p. 17.

[48] On the critical work of metaphorical poetics, see Caracciolo's *Narrating the Mesh*, which approaches creative metaphor as the 'primary stylistic form through which narrative may realize multiscalarity' (p. 140).

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In Jeff VanderMeer's *Southern Reach* trilogy, a small section of the American coast is separated from the mainland by a mysterious event.[49] Area X, as the authorities rename it, appears to develop a will of its own and rapidly evolves into a pristine environment, untouched by pollutants. When they enter this autonomous biosphere, humans mutate into new living forms. Is Area X, then, an image of the Earth? It is both a radically alien space and a microcosm that enacts an accelerated form of what Lovelock calls the 'revenge of Gaia'.[50] I read this type of fictional space, which both represents the Earth and yet differs from it, through the trope of synecdoche, which substitutes a part for a whole or a whole for a part. Following Richard Lanham's definition of synecdoche as a form of 'scale-change', Derek Woods has demonstrated the fundamental role of this trope in representations of the ecosystem, arguing that ecological discourse cannot resist its 'gravitational force'.[51] As I explore this force in contemporary fiction, I argue that synecdoche has the potential to hold part and whole in critical tension, rather than collapse their differences. This potential is significant at a time when individual humans are struggling to recognise themselves in the species named by the Anthropocene, yet the global ecological crisis is calling for response-ability on a local level. I agree with D. D. Carpini's observation that synecdoche should not be limited to a narrow view where 'difference is transmuted into figurations of connectedness' and synecdoche is ultimately conflated with metaphor: the alternative is viewing synecdoche as '"understanding one thing *with* another" as opposed to understanding one thing "in terms of another"'.[52] The distinction is essential to the argument I make in the first half of this book, which is that synecdoche can question relations between scales.[53]

Alongside critical synecdoche, I identify metalepsis and situational irony as key devices through which fiction connects different scales of life. My hypothesis is that metalepsis and irony, because they highlight the coexistence of different *narrative levels*, are particularly apt to articulate tensions between different *narrated scales*. In the fiction presented in this book, human encounters with other scales of life are often

[49] VanderMeer's 2014 trilogy is composed of *Annihilation*, *Authority*, and *Acceptance*. A fourth novel, *Absolution*, published in 2024, has turned the trilogy into a tetralogy.

[50] Lovelock, *Revenge of Gaia*. [51] Woods, 'Scale', p. 127. [52] Carpini, 'Synecdoche'.

[53] For further ecocritical valorisations of non-analogical figures, see Tom Idema's suggestion that '[t]hinking synecdochically rather than metaphorically is more in tune with the Gaian view of life, [. . .] the small and the large always connected but never reducible to the other' (*Stages of Transmutation*, p. 118), and Caracciolo's critique of the symbolic projection of human cognitive assumptions onto nonhumans (*Contemporary Fiction*, p. 89).

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portrayed as metaleptic events, where one level of narrative is contaminated or transgressed by another. Scales vaster than the human, such as ecosystems or species, are glimpsed as elusive, overarching stories. Viruses and DNA are described as invisible authors, writing the human from within. In the typology proposed by Michelle Ryan, these are *ontological* metalepses: more than perfunctory transgressions, they destabilise self and world.[54] I find that the frame-breaking aesthetics of metalepsis helps fiction to register the shock of entanglement between disjunct scales of life, and throws into relief the need for an epistemic and ethical relation to the other scale, whether this be the invisible agency of genetic molecules or the vast complexity of ecosystem balance. Following these rifts and leaps between scales leads me, in Chapter 6 and in the Conclusion, to evaluate irony as a key mode for writing and reading multi-scalar life. Rather than a trope, I investigate irony as a mode which is produced by multiple perspectives on one situation, and which is highly sensitive to discrepancies between perception at one scale and perception at another.

Chapter 1 maps out the theoretical and cultural context for the early twenty-first century's multi-scalar view of life. Progressing from the microscopic scale to the planetary perspective, I present the recent shifts in microbiology, biomedicine, anthropology, and Earth system science that are shaping our awareness of interdependence among living processes. In each domain, I draw attention to the narrative and rhetorical aspects of these epistemological shifts – how they effectively change the story that is being told about life, and what tropes they employ. This overview leads me to discuss some of the theoretical terminology frequently used to conceptualise interdependence across scales, and the different models of life brought into play by the terms *process*, *network*, *assemblage*, and *meshwork*. The final section outlines the scalar rhetoric and tropes of early twenty-first-century popular science. Here I examine the relation between trans-scalar rhetoric, which emphasises the necessity of thinking across scales, and multi-scalar tropes, which substitute one scale of life for another. From a scale-critical perspective, I examine the epistemological tensions at work in those tropes.

Chapters 2–6 examine how fiction engages with this context, to which it contributes its own multi-scalar rhetoric, and how it brings into play the ethics and symbiopolitics of trans-scalar relations. Although each study can be read independently, Chapters 2 and 3

[54] Ryan, *Avatars*, p. 207.

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work together to propose a reflection on environmental synecdoche, while Chapters 4 and 5 both analyse ontological metalepsis as a narrative strategy with ecopolitical and biopolitical implications. Chapter 6 tackles a nagging question that emerges from the rest: must fiction's relation to multi-scalar perspectives be a pedagogical one, a useful teaching of scalar literacy? And, if not, how do we read lighter engagements with the multi-scalar view?

In Chapter 2, I compare three narratives that construe landscapes as multi-scalar relational fields. In Amitav Ghosh's *The Hungry Tide*, Leslie Marmon Silko's *Gardens in the Dunes*, and A. S. Byatt's 'A Stone Woman', environments are cast no longer as settings but as living actors of the story. I read these poetics through Tim Ingold's conceptualisation of landscape as a meshwork of entangled lines of life, to suggest that these fictions turn landscapes into mediators connecting human to ecosystemic scales, and biological temporality to 'geostory'.[55] My analysis focuses on the recurring trope of the microcosm, which allows fiction to explore large-scale ecological disruption through smaller organisms and environments. The microcosm, I argue, is a figure in tension which acts here simultaneously as a trans-scalar viewing instrument and a disruptor of relations between scales. I read this trope as a critical tool of ecological awareness because it foregrounds and questions *scalar collapse* – the epistemic projection of one scale onto another.

In Chapter 3, I analyse the critical potential of environmental synecdoche in works of fiction that question the autonomy of human agency. Jeanette Winterson's *The Stone Gods* and Jeff VanderMeer's *Southern Reach* trilogy mock fantasies of control by portraying humans as inseparable from multi-scalar assemblages and symbiotic associations. I read these novels as experiments in the cognitive modelling of agency at unfamiliar scales: both the microscale of a postgenomic imaginary and the macroscale of planet and species demanded by Anthropocene awareness. These fictions, I suggest, explore the difficulty of reconciling environmental responsibility with the dispersal of agency inherent in biomedical and ecological perspectives. Both novels experiment with multi-scalar tropes as a means of modelling agency at unfamiliar scales, and enabling environmental response-ability. In each narrative, I contrast the lure of analogical images with the poetics of critical

[55] Latour, 'Agency', p. 3.

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synecdoche, which engages productively with the complexity of diffuse environmental agency.

Chapter 4 discusses the ethical potential of fictional trans-scalar encounters. Richard Powers's *The Overstory* and Alexis Wright's *The Swan Book* confront human characters with unfamiliar scales of existence: the slow time of trees, the multitudinous identity of forest or flock, the accelerating time of climate change, and the geographical patterns of collective migration. Both novels highlight disjunctions between scales as a key obstacle to environmental response-ability, by contrasting a sacrificed location with globalisation's discourse of prosperity. These stories also highlight the fractures between individual and species-scale behaviour, and the difficulty of relating to the self as species. These fault lines lead me to ask whether allegorical narrative might in itself constitute a hindrance to trans-scalar ethics by smoothing out disjunctions and scale effects. I suggest that metalepsis acts as a counterweight to allegory in these novels: by construing trans-scalar encounters as frame-breaking events, metalepsis opens up the possibility of ethical relation.

Chapter 5 continues to analyse fictional encounters with other scales of life, but shifts the scene of these encounters to within the human body. Reading David Mitchell's *The Bone Clocks* alongside Greg Bear's *Darwin's Radio*, I show that both novels represent the self as a space of cohabitation and co-evolution, where symbiotic relations embed the temporality of human characters within other timescales. I read these plots as symbiopolitical experiments that question the 'dis-embedding' of life performed by biocapitalism.[56] Because it resists the separation of self from non-self, the symbiotic subject destabilises the type of immunological politics theorised by Roberto Esposito and Frédéric Neyrat, where fantasies of biological and social immunity are built upon defensive boundaries.[57] In these novels, such immunitary fantasies are undermined by metaleptic poetics, where the self is both co-written by others within and forced to position itself within the narrative of its own species. These strange loops open up the narrative of the self to the necessity of symbiopolitical relations.

Chapter 6 compares three texts that engage irreverently with multiscalar perspectives, to outline the rhetorical strategy that I call *scalar irony* – a form of situational irony produced by the discrepancy between

[56] On the dis-embedding of vitality by contemporary bioeconomics, see Rose, *Politics*, p. 38.
[57] Esposito, *Immunitas*; Frédéric Neyrat, 'Intact'.

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perceptions at different scales. I read Margaret Atwood's 'Torching the Dusties', T. C. Boyle's *The Terranauts*, and Ali Smith's *Winter* as ironic exercises in ecological focalisation. The difficulty of biosphere perception is highlighted in each of these texts through visual hallucinations and blind spots, which represent ethical failures. These stories do not work didactically; rather, they respond satirically to the difficulty of perceiving a planetary ecological crisis, and question the idea of enlightenment as a step towards environmental responsibility. But neither do they endorse the cynical perspective. Instead, this fiction explores an ironic mode of multi-scalar attention which holds together incompatible perspectives. This leads me to present scalar irony as a key epistemic and ethical tool, which offers a way forward for Anthropocene response-ability.

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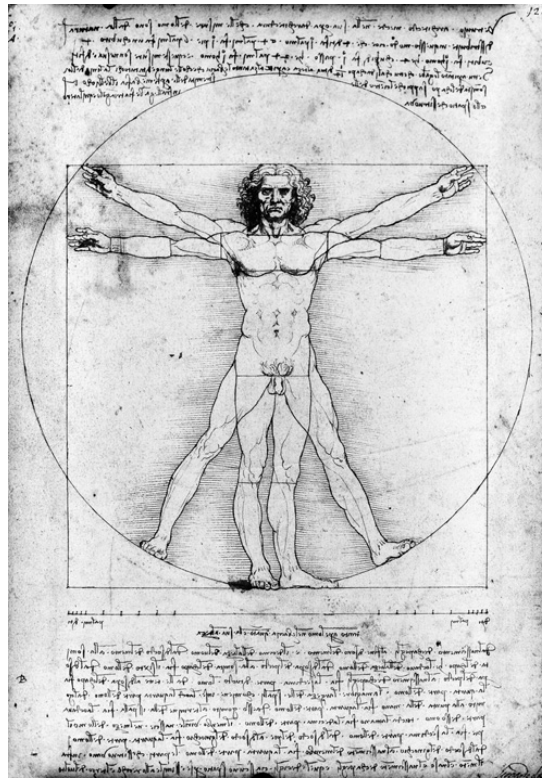


Figure 1 Leonardo Da Vinci, *Vitruvian Man*, c. 1492. Photograph @ Paris Orlando, CC BY-SA 4.0.

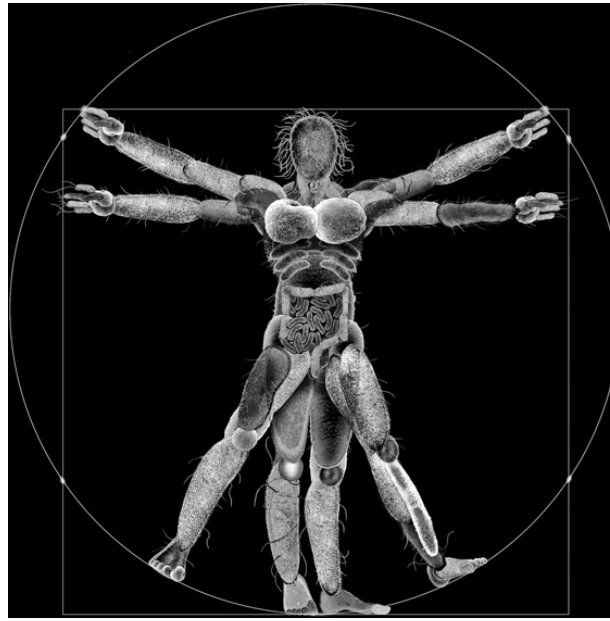


Figure 2 Jon Berkeley, *Microbial Man*, 2012. Image @ Jon Berkeley. All rights reserved.

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