

An aerial photograph of a river valley. A wide, green river flows from the top left towards the bottom right. The surrounding mountains are covered in dense vegetation, appearing in shades of purple, pink, and yellow. The river's path is marked by a dark, winding line.

LIFE, RE-SCALED

**The Biological Imagination
in 21st-Century Literature
and Performance**

**EDITED BY LILIANE CAMPOS
AND PIERRE-LOUIS PATOINE**



© 2022 Liliane Campos and Pierre-Louis Patoine. Copyright of individual chapters is maintained by the chapter's authors.

This book was published with the support of the Institut Universitaire de France, the Sorbonne Nouvelle University, and the PRISMES – EA 4398 research laboratory.



This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0). This license allows you to share, copy, distribute and transmit the text; to adapt the text for non-commercial purposes of the text providing attribution is made to the authors (but not in any way that suggests that they endorse you or your use of the work). Attribution should include the following information:

Liliane Campos and Pierre-Louis Patoine (eds), *Life, Re-Scaled: The Biological Imagination in Twenty-First-Century Literature and Performance*. Cambridge, UK: Open Book Publishers, 2022, <https://doi.org/10.11647/OBP.0303>

Further details about Creative Commons licenses are available at <https://creativecommons.org/licenses>

All external links were active at the time of publication unless otherwise stated and have been archived via the Internet Archive Wayback Machine at <https://archive.org/web>

Updated digital material and resources associated with this volume are available at <https://doi.org/10.11647/OBP.0303#resources>

Every effort has been made to identify and contact copyright holders and any omission or error will be corrected if notification is made to the publisher.

ISBN Paperback: 9781800647497

ISBN Hardback: 9781800647503

ISBN Digital (PDF): 9781800647510

ISBN Digital ebook (EPUB): 9781800647527

ISBN Digital ebook (AZW3): 9781800647534

ISBN XML: 9781800647541

ISBN HTML: 9781800647558

DOI: 10.11647/OBP.0303

Cover: 'Life Along the Nile', image by Earth Resources Observation and Science (EROS) Center (2014), <https://www.usgs.gov/media/images/life-along-nile>. Public domain. Cover design by Katy Saunders.

1. Introduction

Liliane Campos and Pierre-Louis Patoine

Looking back at the twentieth century, evolutionary biology and genetics stand out as two immensely influential sciences, whose images and discourses shaped the imagination of life across cultural forms. While Darwin's 'plots', as Gillian Beer noted in 2000, continued to generate productive and conflicting narratives, Darwin's presence 'in argument and in popular imagination' was strengthened by the progressive rise of genetic research.¹ The 'modern synthesis'² of the theory of evolution with that of Mendelian heredity, and the subsequent discovery of DNA and mapping of genes, prolonged and renewed many of the controversies surrounding the first reception of *The Origin of Species*. Human exceptionalism was questioned once again by newly discovered proximities between humans and other life forms, all equally reduced to 'elaborate contraptions [...] constructed and controlled by genes'.³ Determinism seemed to return in a new biological guise. Just as the keywords of nineteenth-century evolutionary theory—words such as *struggle*, *nature*, *family*—drew what Beer calls their 'story-generating' strength from the variety of meanings they evoked,⁴ certain words related to DNA—particularly its description as a *code* or *programme*—presented it as the 'logos of life' through a terminology whose very

1 Gillian Beer, 'Preface to the Second Edition', in *Darwin's Plots: Evolutionary Narrative in Darwin, George Eliot and Nineteenth-Century Fiction* (Cambridge: Cambridge University Press, 1983, 2000), pp. xvii–xxxii (p. xxiii), <https://doi.org/10.1017/CBO9780511770401>

2 Julian Huxley, *Evolution: The Modern Synthesis* (London: Allan & Unwin, 1942).

3 Evan Thompson, *Mind in Life: Biology, Phenomenology and the Sciences of Mind* (Cambridge MA: Harvard University Press, 2007), p. 173.

4 Beer, 'Preface', p. xxv.

familiarity was rich with narrative potential.⁵ The language of biological theory, as it percolates through the different media of its time, is always already rife with images and ambiguities. The growing field of 'science and literature studies' has demonstrated that novelists, poets and playwrights were quick to reveal and respond to such figurative and narrative potentialities.⁶

If natural selection and the genetic code were defining paradigms for the imagination of the nineteenth and twentieth centuries, what might be the equivalent for the twenty-first century? Twenty years into the promised 'century of biology',⁷ this book begins to answer that question, by investigating engagements with life sciences and biopolitical questions in recent European and North American fiction, poetry, graphic novels and performance. Though it is clear that images drawn from evolutionary theory and genetics, particularly those that move beyond genocentrism, continue to inform representations of organic life, the essays gathered here turn to some of the fields that have attracted most attention in recent years.⁸ They ask how artistic work integrates

-
- 5 Claire Hanson, *Genetics and the Literary Imagination* (Oxford: Oxford University Press, 2020), p. 1, <https://doi.org/10.1093/oso/9780198813286.001.0001>
 - 6 Recent titles include Kirsten E. Shepherd-Barr's *Theatre and Evolution from Ibsen to Beckett* (New York: Columbia University Press, 2015); Natania Meeker and Antónia Szabari's *Radical Botany: Plants and Speculative Fiction* (New York: Fordham University Press, 2019), <https://doi.org/10.5422/fordham/9780823286638.001.0001>; Josie Gill, *Biofictions: Race, Genetics and the Contemporary Novel* (London: Bloomsbury, 2020), <https://doi.org/10.5040/9781350099869>; Tom Idema, *Stages of Transmutation: Science Fiction, Biology, and Environmental Posthumanism* (New York: Routledge, 2019); Clelia Falletti, Gabriele Sofia, and Victor Jacono, eds, *Theatre and Cognitive Neuroscience* (London: Bloomsbury, 2016); Jason Tougaw, *The Elusive Brain: Literary Experiments in the Age of Neuroscience* (New Haven: Yale University Press, 2018); Sam Solnick, *Poetry and the Anthropocene: Ecology, Biology and Technology in Contemporary British and Irish Poetry* (New York: Routledge, 2016), <https://doi.org/10.4324/9781315673578>; Lejla Kucukalic, *Biofictions: Literary and Visual Imagination in the Age of Biotechnology* (New York: Routledge 2021), <https://doi.org/10.4324/9781003132325>; Lara Choksey, *Narrative in the Age of the Genome: Genetic Worlds* (London: Bloomsbury Academic, 2021).
 - 7 Craig Venter and Daniel Cohen, 'The Century of Biology', *New Perspectives Quarterly*, 21 (2004), 73–77, <https://doi.org/10.1111/npqu.11423>. See also W. John Kress and Gary W. Barrett, eds, *A New Century of Biology* (London: Penguin Random House, 2016).
 - 8 The essays gathered in this volume were written following a series of workshops supported by the Institut Universitaire de France (IUF) and organized at the Sorbonne Nouvelle in 2019 and 2020. The workshops invited scholars working in the fields of literature and science, medical humanities, ecocriticism and microbiology

new knowledge about neurons, microbes or fungi, how it echoes new perspectives brought by epidemiology, ecosystem modelling, or Earth System science, and how it contributes to critical thought concerned with those fields. As they tease out the key images and ideas informing representations of human and other-than-human life, the studies in this volume demonstrate contemporary Western culture's fascination for the life sciences—from microbiology to ecology. The fields under scrutiny also include demographics, climate science and geology. Indeed, firm boundaries between 'life' sciences and physical sciences seem increasingly artificial when life is considered at the scale of an 'Earth System'—a system, moreover, whose balance is rapidly shifting.

It will be no surprise, therefore, that this volume highlights intricate connections and overlaps between different scientific imaginaries in contemporary literature and performance. Susan M. Squier, in her analysis of climate change comics, demonstrates that the imagination of biodiversity loss is linked with fraught questions of climate science communication. Through her study of Welsh poet Gillian Clarke, Sophie Musitelli argues that contemporary biological images are infused with the geological awareness of Anthropocene writing. Her investigation of fossilized life is echoed by Kristin Ferebee's analysis of the graphic novel *Sweet Tooth*, which contrasts the 'fossilized death' driving oil-based economies with the connection, preserved in indigenous ontologies, between life and fossil strata. In their critical readings of post-apocalyptic fiction, Pieter Vermeulen and Rishi Goyal ask what unspoken biopolitical ideologies, fantasies of biopower and population control may lurk behind pandemic imaginaries. Contemporary performance, explored here by Kirsten E. Shepherd-Barr, Hannah Simpson, and Eliane Beaufils, encounters challenging yet generative paradoxes when it engages with the non-anthropocentric perspectives of ecology and climate science.

These essays prove it is worth asking, once again, the questions formulated by Gillian Beer: 'What new tales are being unleashed from scientific work now? And what new forms for storytelling?'⁹ And, we might add, what new scales? For the scale at which we imagine life is a recurrent, central concern in the artistic work examined here. The

to explore new scales and images derived from biology in twenty-first-century literature and performance.

9 Beer, 'Preface', p. xxviii.

writers and performers presented in this volume not only question our relation to microscopic or macroscopic scales, from cellular biology to climatology, but also experiment with aesthetics that connect disparate scales, including alternating focalizations, 'pluriverse' perspectives, 'multiscale narration', utopian microcosms, and 'neo-sublime' or grotesque aesthetics. In the neuronarratives examined by Jason Tougaw and Pascale Antolin, the key question is the 'explanatory gap' between neurobiological phenomena and human experience, in a culture suffused with misleadingly transparent images of the brain. For the ecocritical studies in this volume, the gaps are rather those that separate everyday perception from the realization that human life depends on microbiological and macroecological phenomena. From those perspectives, it becomes clear that relations between different scales of life is a crucial, perhaps *the* crucial question that emerges from our contemporary biological imagination.

The idea of forms being 'unleashed from scientific work' may seem outdated, suggesting that science is a source or resource to be tapped. Rather than viewing either science, literature, or performance as the primary source of biological imaginaries, we follow N. Katherine Hayles' advice to beware of the idea that 'influence' flows from one field to another. The 'cross-currents', as Hayles points out, 'are considerably more complex than a one-way model of influence would allow', since 'culture circulates through science no less than science circulates through culture'.¹⁰ These complex currents appear clearly when we pay attention to how popular science—the forms science takes when engaging general audiences—interacts with contemporary imaginaries. In their contributions to this volume, Paul Hamann-Rose and Derek Woods are attentive to the evolution of popular biology texts, and of their figurative and affective strategies, over time. As they attempt to pinpoint the defining traits of contemporary 'mycoaesthetics', or the 'molecular sublime', they draw our attention to the circulation of images and narrative structures between fiction and popular science. Cross-currents are also mapped out by Pieter Vermeulen and Rishi Goyal in their respective discussion of population politics and aesthetics, moving from economist Thomas Malthus' 1798 *Essay on the Principle of Population*, to

10 N. Katherine Hayles, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago: University of Chicago Press, 1999), pp. 21–22.

biologists Paul and Anne Ehrlich's 1968 best-seller *The Population Bomb*, to the depopulated utopias of post-catastrophe fiction, and the unequal treatment of infectious diseases according to a prejudiced demographic imagination. Gillian Beer's phrasing, however, remains productive in the way it allows content to slip into form, in a conscious echo of Propp's morphological approach to narrative. Contemporary fiction, as Ben De Bruyn's essay on Jon McGregor demonstrates, experiments with forms comparable to ecosystem monitoring and modelling. Beer, moreover, does not satisfy herself with the angle of influence. 'Are there stories', she asks in the same paragraph, 'to be told from places and organisms until now unrecognised?'¹¹ Contemporary writers and performers, we find throughout this book, try to tell tales from places and organisms that, although perhaps not 'unrecognised', are unexpected—the anthropomorphized perspective of an ailing 'Gaia', the 'invasive' species of destabilized habitats, the 'weird' bodies of fungi, or the microbial 'landscapes' of the human body.

Bringing together scholars in literature and performance studies, our enquiry does not claim to be in itself interdisciplinary, instead it explores interdiscursivity and the cross-fertilizing of imaginaries between contemporary artistic work, popularizations of the life sciences, and philosophy. The resulting collection outlines literature and performance's encounter with, and creation of, an emergent and multifaceted biological imagination.

Imagination, Science and Power

Imagination is not the remit of artistic work. This volume explores the visual and figurative strategies of literature and performance, but also how they engage with the imaginative dimensions of contemporary ecological, biomedical and biopolitical discourses. Such engagements unfold against the background of rising interest, in both the arts and the humanities, for life forms and perspectives that challenge earlier modes of representation: composite, relational entities such as symbionts or holobionts; previously neglected forms of consciousness, captured by terms such as 'neurodiversity' or the ecological 'pluriverse', including

11 Beer, 'Preface', p. xxviii.

animated, vibrant matter; newly studied types of communication, within fungal networks or microbial communities; and phenomena whose fluidity and complexity defy easy representation, many of which tend to be viewed, in the humanities, through the prism of Timothy Morton's catchword 'hyperobject'.¹² The poems, novels and performances examined in this volume seeks out those representational challenges: they attempt to visualize, narrate, perform, perhaps even model such entities.¹³

In his influential work on the idea of a 'scientific imagination', Gerald Holton proposes to differentiate between visual imagination, analogical imagination, and thematic imagination. Holton defends the key role of scientific imagination in the forging of theories: how Galileo's knowledge of Euclidean geometry, for instance, may have helped him visualize and understand the shapes of the moon; or how analogies such as Darwin's 'tangled bank' or the military metaphors of medical discourse (like an 'invading virus', or 'losing the battle with cancer') shaped emerging narratives of life. He distinguishes from visualization and metaphor a third type of imagination which he identifies as *thematic*: *themata*, an example of which would be 'discontinuity' in the early formulations of quantum physics, are 'the often unconfessed or even unconscious basic presuppositions, preferences, and preconceptions that scientists may choose to adopt, even if not led to do so by the data or current theory'.¹⁴ Although Holton is mostly interested in these three types of imagination as tools that can 'energize the initial phases of research', visualization, analogy and *themata* are also productive entries for our enquiry into the cross-currents between scientific and artistic imaginaries.

12 Timothy Morton, *Hyperobjects: Philosophy and Ecology After the End of the World* (Minneapolis: University of Minnesota Press, 2013). See Kristin Ferebee, Susan M. Squier, Kirsten E. Shepherd-Barr and Hannah Simpson's chapters in this volume (chapters 8, 11 and 12).

13 Caroline Levine defends 'model thinking' as a way of reading literature: because they move across scales and media, models 'sharpen or set in motion our knowledge of a reality that is not available to direct perception' and 'allow us to understand forms at work. That is, by detaching shapes, orders, and arrangements from particular contexts, they allow us to play out the affordances of forms, especially in their interactions with other forms' ('Model Thinking: Generalization, Political Form, and the Common Good', *New Literary History*, 48.4 (2017), 633–53, p. 644, p. 643, <https://doi.org/10.1353/nlh.2017.0033>).

14 Gerald Holton, 'On the Art of Scientific Imagination', *Daedalus*, 125.2 (Spring 1996), 183–208 (p. 201).

Undeniably, the way organic life is imagined in the twenty-first century is shaped by scientific visualizations, whether in the form of medical imaging (chapter 6), ecosystem modelling (chapter 10), demographic graphs (chapter 9), satellite images (chapter 11) or other kinds of data visualization which are popularized and sometimes misconstrued in journalistic and social media. The problematic ‘reality effect’ of certain visualizations is a well-studied phenomenon:¹⁵ in our volume this issue arises particularly around brain imaging technology—a particularly striking case of the mainstream media’s tendency to hide the complexity of data visualization behind easily ‘readable’ images, which give the illusion of direct access, in this case to human consciousness. Such images remain techniques of what Foucault refers to as *savoir*, forms of knowledge that subsume power relations and hierarchizations beneath apparent transparency.¹⁶ Aesthetic forms that engage with these images provide opportunities for critical, sometimes satirical, distance. Beyond the specific case of medical imaging, each modelling choice carries epistemological orientations that have simultaneously aesthetic and political ramifications: a key question for contemporary evolutionary biologists, for example, is the benefit of moving away from arborescent models towards network representations,¹⁷ a move that, by changing how we perceive evolution, changes how we conceive of progress and of the power hierarchies historically established in its name. Epistemic forms thus often carry within them ethical options and figurative choices, which operate as metaphors beyond the literal visualizations they inform, so that Holton’s distinction between visual, analogical, and thematic imagination reveals itself to be porous, identifying three angles of enquiry rather than three separate domains.

The analogies and metaphors that exist in scientific discourse—but also, perhaps more importantly for our enquiry, in popular science—play a key role in artistic attempts to grapple with new conceptions of organic life. One of the most interesting aspects of such figurative language is shifts in metaphors: how microbiology is gradually moving

15 For a summary of scholarship discussing this issue in neuroscience, see Jason Tougaw, *The Elusive Brain*.

16 Michel Foucault, *Histoire de la sexualité I : La volonté de savoir* (Paris: Gallimard, 1976).

17 See for instance Julie Beaugard-Racine et al., ‘Of woods and webs: possible alternatives to the tree of life for studying genomic fluidity in *E. coli*’, *Biology Direct*, 6.39 (2011), <https://doi.org/10.1186/1745-6150-6-39>.

away from military lexical fields towards ecological similes;¹⁸ or how the individualistic imaginary of the ‘selfish gene’, associated to molecular Neo-Darwinism, has been undermined by a post-genomic approach to the genome as a system reacting to internal and external environments.¹⁹ Here too, evolving representations in biology carry consequences for ethics and politics. The foregrounding of recursive relations between gene, organism, and environment—where before we saw ‘selfish’ genes and mostly linear causation—may, for example, help to challenge the political models that used evolutionary terms such as ‘survival of the fittest’ to naturalize individualism or liberalism.

Ecological theory has also undergone crucial figurative shifts over the past century. Ben De Bruyn, in his contribution to this volume, highlights the distrust expressed towards the image of the ecosystem by researchers in the environmental humanities, such as Vinciane Despret, who links it to the ‘machine analogy’ of the ‘balance of nature’, or Elizabeth Deloughrey, who has studied the intertwined history of island ecosystem ecology and military agendas.²⁰ Stepping back from the term ‘ecosystem’ to find the figures that tend to represent it, Derek Woods argues that:

In influential works of ecological science writing, two tropes are prevalent: *scala*, which I define elsewhere as the substitution of “one object for another across at least a degree of magnitude,” usually starting with an object perceivable by our senses; and *technomorphism*, which substitutes a technological object for a natural one (63). The figures of the chain, the wheel, the terrarium or aquarium, and the computer or digital network are all examples of at least one of these tropes.²¹

18 Eric Baptiste et al., ‘The Epistemic Revolution Induced by Microbiome Studies: An Interdisciplinary View’, *Biology*, 10.7 (2021), 651, <https://doi.org/10.3390/biology10070651>.

19 Hanson, *Genetics*, p. 2.

20 Vinciane Despret and Michel Meuret, ‘Cosmoecological Sheep and the Arts of Living on a Damaged Planet’, *Environmental Humanities*, 8.1 (2016), 24–36 (p. 26), <https://doi.org/10.1215/22011919-3527704>; Elizabeth DeLoughrey, ‘The Myth of Isolates: Ecosystem Ecologies in the Nuclear Pacific’, *Cultural Geographies*, 20.2 (2013), 167–84, <https://doi.org/10.1177/1474474012463664>.

21 Derek Woods, ‘Scale in Ecological Science Writing’, *Routledge Handbook of Ecocriticism and Environmental Communication*, ed. by Scott Slovic, Swarnalatha Rangarajan, and Vidya Sarveswaran (Oxon: Routledge, 2020), pp. 118–28 (p. 120), <https://doi.org/10.4324/9781315167343-11>.

Such tropes, according to Woods, allowed writers to move beyond the image of the superorganism inherited from early twentieth-century ecological science, and which later formulations and figures of the ecosystem tried to leave behind. Nevertheless, we can wonder whether images like the ‘supercomputer’ are fundamentally different from the superorganism: ‘[d]espite the critiques and alternatives, writers keep reinventing the wheel of the larger-scale organism, pulled in by the gravitational force of synecdoche’.²² Against this force, which implies the possibility of substitution between parts and a larger whole, Woods examines the work of scala and technomorphism, emphasizing the capacity of certain tropes, the network in particular, to avoid substitution across scales.

While Derek Woods has questioned the cultural work of synecdoche, Ursula Heise has emphasized the key role of allegory in the images of planetary life premised on ‘synthesis, holism and connectedness’, that dominated the 1960s and 70s. Images such as Lovelock and Margulis’ Gaia reflected a conception of ‘global ecology as harmonious, balanced, and self-regenerating’.²³ While Heise notes a decline of such allegories in the last decades of the twentieth century, they have more recently been set to work by philosophers such as Bruno Latour, who tries, through the figure of Gaia, to articulate the epistemic earthquake required to understand the Earth System as reacting to human action. The contemporary artworks studied by our contributors seem to confirm Latour’s assertion that such a system can only be viewed from the ‘inside’.²⁴ Wary of the distanced view, they zoom in. Seasonal migrations in McGregor’s *Reservoir 13*, variations in fish population in Kurlansky’s *The Story of Kram and Ailat*, coal formation in Gillian Clarke’s poetry, or

22 Ibid., p. 127.

23 According to Heise, ‘from McLuhan’s “global village”, Fuller’s “Spaceship Earth”, and Lovelock’s “Gaia” to visual portrayals of Planet Earth as a precious, marble-like jewel exposed in its fragility and limits against the undefined blackness of outer space, these representations relied on summarizing the abstract complexity of global systems in relatively simple and concrete images that foregrounded synthesis, holism and connectedness’ (Ursula K. Heise, *Sense of Place and Sense of Planet: The Environmental Imagination of the Global*, Oxford University Press, 2008, p. 63, <https://doi.org/10.1093/acprof:oso/9780195335637.001.0001>).

24 Bruno Latour, *Facing Gaia*, trans. by Catherine Porter (Cambridge: Polity Press, 2017). See also Frédérique Ait-Touati and Bruno Latour’s 2017 performance lecture *Inside* (<http://www.bruno-latour.fr/node/755.html>).

the 'rewilding' of a specific urban garden in Tobias Rausch's *Planttheater* are limited, situated entry points that open toward more abstract visions of living systems. Such privileging of the 'inside view' implies a partial turning away from a Modern episteme predicated on a distanced view, supposed to guarantee objectivity and universality—but that in effect served to impose forms of imperial and colonial power from afar, both on human populations and on ecosystems.²⁵

The image of the network, which pervades contemporary representations of ecological interdependence, could be considered an example of what Horton calls *thematic* imagination. The portrayal of fungi-forest symbioses as a 'wood wide web' is in itself a technological image which, as Woods analyses in his contribution to this volume, often hides the mycelium behind the tree: he agrees in this with Jedediah Purdy, who has satirized the inevitability with which, 'after centuries of viewing forests as kingdoms, then as factories (and, along the way, as cathedrals for Romantic sentiment), the 21st century would discover a networked information system under the leaves and humus'.²⁶ As a dominant image through which life forms are imagined today, the web in itself is an organic image turned technological. The 'web', like the 'virus', may have started out as organic images for information technology, but they return, somewhat uncannily, as technological entries into biological realities, when the now familiar world of computers and internet connectivity helps us to imagine strange biology.

This volume contains many timely reminders that the imagination of life is unavoidably biopolitical. Michel Foucault's conception of biopower, as a type of power 'situated and exercised at the level of life, the species, the race, and the large-scale phenomena of population',²⁷ remains an indispensable hinge around which to think about the relations constructed by biomedicine, health policies and environmental discourse. The power exercised by medical representations, and the racial and social dimensions of public health, emerge clearly from the sections focused on neuronarratives and pandemic fictions. As Rishi

25 Aníbal Quijano, 'Coloniality and Modernity/Rationality', *Cultural Studies*, 21.2–3 (2007), 168–78, <https://doi.org/10.1080/09502380601164353>.

26 Jedediah Purdy, 'Thinking Like a Mountain', *N+1*, 29 (2017), <https://nplusonemag.com/issue-29/reviews/thinking-like-a-mountain/>.

27 Michel Foucault, *The History of Sexuality, Volume 1: An Introduction*, trans. by Robert Hurley (New York: Vintage, 1990), p. 137.

Goyal reminds us, following Foucault, ‘racism is the ‘indispensable precondition’ that authorizes the biopolitical state’s right to kill’ (chapter 7). In the context of a pandemic management that reactivated a history of treating racialized ‘flesh’²⁸ as impersonal, manageable matter, pandemic fictions might serve to destabilise what Sylvia Wynter has identified as the Modern reduction of the human to ‘Man’—a patriarchal, white version of the human rooted in the racism that accompanied the birth of modernity in the fifteenth and sixteenth centuries. For Wynter, the human is not only a racialized conception, but also a biologized one, since Western modernity employed Darwinian thought to contrast the Western Bourgeois ‘human’ to those subhumans considered to have been ‘dysselected’ by evolution. As a result, what Wynter calls the ‘biocentric ethnoclass genre of the human’ uses both ‘biogenetic and economic notions of freedom’ to justify the continuing sacrifice of ‘the peoples of African hereditary descent and the peoples who comprise the damned archipelagoes of the Poor, the jobless, the homeless, the “underdeveloped”’. Injustice is thus justified by biology, in a mode of thought that conveniently attributes our contemporary order to ‘the imagined agency of Evolution and Natural Selection’.²⁹

The pandemic imaginaries presented in this book highlight the biopolitical exclusion or invisibilization of racialized and economically marginalized others. The racialized, falsely ‘empty’ cities analysed by Rishi Goyal in chapter 7 resonate with what Pieter Vermeulen calls the ‘population unconscious’ of certain pandemic novels, fictions which assuage unspoken fears of overpopulation by emptying the world of the undesirable many, so that the happy few may thrive (chapter 9). Imagined catastrophes thus place a spotlight on existing political hierarchies, including the extractive practices of ‘settler-capitalist world ecology’ analysed by Kristin Ferebee in chapter 8. The Foucauldian biopolitical angle can be broadened by exploring the relations between human, nonhuman, and even posthuman species in the era Haraway has named Chthulucene. Such multispecies poetics are examined here

28 Hortense Spillers, ‘Mama’s Baby, Papa’s Maybe: An American Grammar Book’, *Diacritics*, 17.2 (1987), 64–81, <https://doi.org/10.2307/464747>.

29 Sylvia Wynter, ‘Unsettling the Coloniality of Being/Power/Truth/Freedom: Towards the Human, After Man, Its Overrepresentation—An Argument’, *The New Centennial Review*, 3.3 (Fall 2003), 257–337 (p. 317), <https://doi.org/10.1353/ncr.2004.0015>.

with the help of philosophical work that opens up perspectives for biopolitical imaginaries beyond the human, including Emanuele Coccia's investigations into the life of plants.³⁰ The limitations of biopower, as a concept, are also probed by more recent formulations that attempt to escape life/non-life binaries and boundaries, notably Elizabeth Povinelli's work on 'geontologies', presented here by Kristin Ferebee in her study of Jeff Lemire's graphic fiction.³¹ As it gradually reveals a long history of transgression, in which both lands and bodies are invaded by Western science, Lemire's *Sweet Tooth* recalls the key points raised by Sherryl Vint in her analysis of contemporary biopolitics: the commodification of life by biotechnology, the erosion of the boundary between the organic and the inert, and the renewal of inherited patterns of dispossession. Lemire's speculative fiction thus explores 'epivitality', this 'life becoming thing' that Sherryl Vint locates in the current flux of biotechnological capitalism,³² but anchors it in the longer colonial history of North America. This colonial context leads Ferebee to read the novel through Povinelli's concept of 'geontopower', asking what ecocritical insight can be gained from this alternative framework, where questions of governance and power are shifted from *bios* to *geos*.

The acknowledgement of interdependencies between human and nonhuman life is so fundamental to contemporary art and philosophy that it might be more accurate to refer to current biopolitics as 'eco-biopolitics'. Many of the works studied in this volume engage with the dominant aesthetic forms of contemporary eco-biopolitical discourse: for instance, what Latour calls the 'pornography of catastrophism' in ecological rhetoric; or the tragic or elegiac modes that shape much discourse concerned with climate disaster and extinction.³³ As Heather

30 Emanuele Coccia, *The Life of Plants: A Metaphysics of Mixture* (Hoboken: Wiley, 2018).

31 Donna J. Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* (Durham: Duke University Press, 2016), <https://doi.org/10.1215/9780822373780>; Elizabeth Povinelli, *Geontologies: A Requiem to Late Liberalism* (Durham: Duke University Press, 2016), <https://doi.org/10.1215/9780822373810>.

32 Sherryl Vint, 'Neoliberalism and the Reinvention of Life', in *Biopolitical Futures in Twenty-First-Century Speculative Fiction* (Cambridge: Cambridge University Press, 2021), 1–24, <https://doi.org/10.1017/9781108979382>.

33 Bruno Latour, quoted in 'Décor as Protagonist: Bruno Latour and Frédérique Aït-Touati on Theatre and the New Climate Regime', Sébastien Hendrickx and Kristof van Baarle, *The Theatre Times* (18 February 2019), <https://thetheatretimes.com/decor-is-not-decor-anymore-bruno-latour-and-frederique-ait-touati-on->

Houser has argued, data itself is aestheticized and integrated into twenty-first-century art in reaction to the *infowhirl* produced by overwhelming amounts of information about ecological emergencies.³⁴ On the other hand, absent images are just as important as those that assail us every day: the dominance of white male experts in the media reporting scientific discourse contributes, for instance, to the racial dimension of pandemic management, and to the gendering of relations between scientific subjects and objects, be they human or Gaian. Anthropocentrism leads biodiversity conservation discourse, and many fictional eco-narratives, to focus on forms of life that may become 'characters': as Ursula Heise has argued, 'charismatic megafauna' tend to dominate in stories of extinction.³⁵ Jeff VanderMeer's *Southern Reach* trilogy, which gives centre stage to the fungal kingdom, may therefore be read in contrast to works like Richard Powers' *Overstory* or even Tobias Rausch's *Planttheater*, which foreground the more easily perceptible and character-like plant kingdom. Anthropomorphism, however, need not be rejected too hastily: Vinciane Despret argues that it provides precious entry points into perspectives beyond that of the human. Some contemporary work, like Deke Weaver's *Unreliable Bestiary* performances, unabashedly embraces the shaping of representations by human imagination (chapter 12).

Bio-medical and ecological imaginaries are thus fundamentally intertwined in twenty-first-century representations. *Silent Spring*, Rachel Carson's now-classic indictment of pesticide-based agriculture, used health as a narrative angle on environmental degradation, alerting readers to their inseparable nature.³⁶ Such overlaps are common in

theatre-and-the-new-climate-regime/. For examples of tragic rhetoric, see the Deep Adaptation movement and Jem Bendell's 'Deep Adaptation: A Map for Navigating Climate Tragedy' (2018, 2020), <http://lifeworth.com/deepadaptation.pdf>. Ecological elegy is discussed by Timothy Morton, 'The Dark Ecology of Elegy', *The Oxford Handbook of Elegy*, ed. by Karen Weisman (Oxford: Oxford University Press, 2010), <https://doi.org/10.1093/oxfordhb/9780199228133.013.0015>.

34 Heather Houser, *Infowhirl: Environmental Art and Literature in an Age of Data* (New York: Columbia University Press, 2020). See also Victoria Vesna, ed., *Database Aesthetics: Art in the Age of Information Overflow* (Minneapolis: University of Minnesota Press, 2007).

35 Ursula K. Heise, *Imagining Extinction: The Cultural Meanings of Endangered Species* (Chicago: University of Chicago Press, 2016), pp. 23–25, <https://doi.org/10.7208/chicago/9780226358338.001.0001>.

36 Rachel Carson, *Silent Spring* (Boston: Houghton Mifflin, 1962).

contemporary representations of the ‘sick’ earth, and more generally in what Anne Hawkins calls *ecopathography*, a narrative mode which ‘links a personal experience of illness with larger environmental, political, or cultural problems’, suggesting that illness is the ‘product of a toxic environment’.³⁷ In the anticipatory fictions studied here, imagined eco-biological futures oscillate between politically questionable emptiness—the city in Ling Ma’s *Severance*, or the post-apocalyptic, depopulated worlds of *Station Eleven* or *Sweet Tooth*—and excess, where viral or fungal contamination, or simply the sheer size of human population, produce potentially horrific, uncontrollable proliferation. In the works focused on the present, *solastalgia*—Glenn Albrecht’s term for a proleptic homesickness linked to awareness of environmental change³⁸—is present (chapter 13), but coexists with other affects, including sublime awe (chapter 2), ecosticism (chapter 10), intimate strangeness (chapter 12), and the soothing lull of disturbingly ‘cosy’ catastrophes (chapter 9).

Questions of Scale

Across the essays presented here, the most striking aspect of these twenty-first-century imaginaries is their engagement with scale. On the one hand, writers and performers are reacting to the worsening climate crisis and to accelerating, anthropogenic ecological damage with a rich array of aesthetic strategies that make the larger scale of planet or ecosystems perceptible and relatable. On the other hand, contemporary artworks are increasingly exploring microscopic life, the invisible scales of microbial or neuro-chemical phenomena that resist everyday human perception, yet shape every moment of our existence: creative practice is responding to the new areas of knowledge opened up by microbiome studies, and to new technical developments such as brain imaging practices. The intimate connection between those two epistemic gestures, scaling *up* and scaling *down*, has been forcibly impressed on us by the COVID-19 pandemic. But the ‘double zoom’ of

37 Anne H. Hawkins, ‘Pathography: patient narratives of illness’, *Western Journal of Medicine*, 171.2 (1999), 127–29.

38 Glenn Albrecht, ‘Solastalgia: the distress caused by environmental change’, *Australasian Psychiatry*, 15 (2007), 95–98, <https://doi.org/10.1080/10398560701701288>.

this lens-shift, towards the very small and the very large, is not limited to epidemiological perspectives: it is a recurrent trait of contemporary ecological discourse. Our working hypothesis, therefore, is that the contemporary biological imagination foregrounds and problematizes relations between the meso-scale of everyday human experience and the micro or macro scales of our increased biomedical and ecological awareness.

It is through questions of scale, then, that creative work engages with the ethical, philosophical, and political issues raised by this century's shifting views of life. The influence of invisible, microscopic entities on everyday life is explored through aesthetics that emphasize defamiliarization: the sublime and the grotesque, in Hamann-Rose's analysis of molecular and microbial representations (chapter 2); but also the weird, in Woods' reading of VanderMeer's trilogy (chapter 4), where disturbing fungal and genetic images embody the 'otherness of microscopic scale and its putative ability to control what happens at the scales of human senses and social systems'. Although strange otherness also pervades contemporary representations of the brain, Antolin and Tougaw show us that contemporary novels and graphic novels expose and question the reduction of meso-scale experience to invisible, neurochemical determinism, so that 'control' of either scale by the other is always an effect of representational strategies. Relations are thus questioned between different scales of life, but also between different scales of perception. The 'local' view, or the close zoom, are used not only as synecdoches for larger ecosystems, but as sites through which to question the possibility of zooming out or in. As Shepherd-Barr and Simpson argue in their analysis of site-specific performances by climate activists, the scattered, simultaneous 'guerrilla theatre' orchestrated by Extinction Rebellion can be viewed as replicating the properties of hyperobjects, so that they are, in fact, '*nonlocal*' in Morton's terminology, just like the 'massively distributed in time and space' ecological hyperobjects that can only be partially perceived (chapter 12).³⁹ Such planetary ambitions are not the only form that scalar awareness may take: Ben De Bruyn's narratological analysis reveals how a focus on apparently normal, everyday life, such as we find in McGregor's fiction,

39 Morton, *Hyperobjects*, p. 1 (emphasis in the original), p. 48.

may combine scalar ‘modesty’ with scalar ‘flexibility’, where attention paid to the minute forms of life and to day-to-day bio-logging places the reader in the position of ecological detective or citizen scientist.

As scale has rapidly become a keyword for much ecocritical research, recent publications in the humanities have outlined several important distinctions between different uses of the term. Following Andrew Herod’s distinction between scale as a ‘mental device’ and as a ‘material social product’, Dürbeck and Hüpkes contrast a materialist perspective that stabilizes ‘scales as socially constructed yet ontologically fixed entities’ with an epistemological perspective that ‘allows us to conceive of scales as contingent ways of framing space and time’.⁴⁰ Pushing distinctions further, Zach Horton identifies four ‘disciplinary models of scale’: *scale as relational ratio*, derived from cartography; *scale as absolute size domain*, derived from physics; *scale as compositional structure of parts to whole*, a model dominant, according to Horton, in engineering and biology; and scale as a *homologous scaling operation* in mathematics.⁴¹ All these models are relevant to representations of life in the current context of planetary ecological crisis, where global perspectives and Anthropocenic views are both necessary and problematic, and the smooth scalability of certain economic models—namely, those of global capitalism—are increasingly contrasted with non-scalable structures. This volume, however, is mainly concerned with literature and performance’s interest in the micro and macro scales of life, the connections they explore between those other scales and the meso-scale of human experience, and the representational strategies they invent to play with scale as an epistemological framework and a visualizing tool. The definitions most relevant to this book are therefore Dürbeck and Hüpkes’ second (epistemological) perspective, and Horton’s first and second models (*scale as relational ratio* and *scale as absolute size domain*). Our collection also benefits from the trend identified by Derek Woods as ‘scale critique’, research in environmental humanities that is attentive to

40 Gabriele Dürbeck and Philip Hüpkes, ‘The Anthropocene as an Age of Scalar Complexity’, in *Narratives of Scale in the Anthropocene: Imagining Human Responsibility*, ed. by Gabriele Dürbeck and Philip Hüpkes (New York: Routledge, 2022), p. 5, <https://doi.org/10.4324/9781003136989>.

41 Zachary Horton, *The Cosmic Zoom: Scale, Knowledge, and Mediation* (Chicago: University of Chicago Press, 2021), pp. 14–22, <https://doi.org/10.7208/chicago/9780226742588.001.0001>.

the effects of scale on the framing of issues. Anna Tsing's work on non-scalability, Bruno Latour's anti-zoom, and Zachary Horton's critique of the cosmic zoom all provide an inspiring context in which to improve our 'scalar literacy'.⁴²

Two main areas of political debate frame our contributors' exploration of trans-scalar relations. As climate change and environmental degradation become ever more pressing topics, this volume reacts against accusations of a 'failure' of environmental imagination, arguing that contemporary work is answering appeals for imaginative action, such as Martin Puchner's search for 'stories for the future', Bruno Latour's call for new 'Gaiaographies', and the now widely shared assertion, within ecocriticism, that one role that art can play is to perform a 'scalar translation' of more-than-human processes.⁴³ Although increasingly difficult to distinguish from such environmental questions, the second area of debate concerns the biopolitics of health and its transformation by recent advances in microbiological science, including microbiomics, virology, cellular biology and neurology. Here too, scalar translation is a key issue, between invisible, microscopic agency, everyday perception, and the large-scale politics of pandemic management. The imagination of viral contagion is intimately linked to the social and racial politics of public health, examined in this collection through pandemic fictions where haunting realities, such as overpopulation or the racialization of disease, are revealed as the dark underside of epidemiological and ecological discourses. Racial politics, which engage the scale of nation or planet, are thus entwined with the microscopic scales of contemporary biomedicine and biotechnology, where the 'politics of life itself', as defined by Nikolas Rose, is concerned with our 'growing capacities

42 See Derek Woods, 'Scale Critique for the Anthropocene', *Minnesota Review*, 83 (2014), 133–42 (p. 40), <https://doi.org/10.1215/00265667-2782327>, and Timothy Clark, *The Value of Ecocriticism* (Cambridge: Cambridge University Press, 2019), pp. 38–56, <https://doi.org/10.1017/9781316155073>.

43 Martin Puchner, *Literature for a Changing Planet* (Princeton: Princeton University Press, 2022); Alexandra Arènes, Bruno Latour, and Jérôme Gaillardet, 'Giving Depth to the Surface: An Exercise in the Gaia-Graphy of Critical Zones', *The Anthropocene Review*, 5.2 (2018), 120–35, <https://doi.org/10.1177/2053019618782257>; Timothy Clark, *The Value of Ecocriticism*, p. 49.

to control, manage, engineer, reshape, and modulate the very vital capacities of human beings as living creatures' on a biochemical level.⁴⁴

A tension arises here between seemingly opposed ecological and medical paradigms: whereas environment discourse privileges figures of connectedness and entanglement, Rose asserts that the twenty-first century's economics of vitality is characterized by 'molecularization', a separation of vitality into 'distinct and discrete' objects.⁴⁵ Where a socio-economic analysis may reveal what Rose calls the 'dis-embedding' of vitality, a cultural analysis of popular science discourse may conversely highlight, as Woods suggests, 'a shift, in cultures of science, from 'bio' to 'eco': from concern with genomes and DNA to Anthropocene ecosystems, climate change, and weird ecologies' (chapter 4). The opposition may seem somewhat artificial: even if 'molecularization' can be conceived primarily as an effect of the pre-eminence of genetics in the biological imagination of the twentieth century's last decades, the development of environmental genomics in the 2000s and 2010s, thanks to high-throughput sequencing, led to a renewed interest for microorganisms within ecosystems, including the human body with its vast and diverse microbiota. These shifts in microbiology and molecular biology might reconcile 'ecological connectedness' with a form of 'molecularization'. Such overlaps are confirmed by Musitelli's analysis (chapter 3), which connects poetic uses of images drawn from cellular biology to environmental awareness, and Hamann-Rose's reading of representations of the human body as microbial ecosystem (chapter 2). Nevertheless, Nikolas Rose's socio-economic emphasis on separation and discreteness, which he links to biovalue and biocapital, remains illuminating for some representations of medical science in

44 Nikolas Rose, *The Politics of Life Itself* (Princeton: Princeton University Press, 2007), p. 3. According to Rose 'The "style of thought" of contemporary biomedicine envisages life at the molecular level, as a set of intelligible vital mechanisms among molecular entities that can be identified, isolated, manipulated, mobilized, recombined, in new practices of intervention, which are no longer constrained by the apparent normativity of a natural order' (p. 6). For an investigation of biotechnological imaginaries, which lie beyond the scope of this volume, see Sherryl Vint, *Biopolitical Futures in Twenty-First-Century Speculative Fiction* (Cambridge: Cambridge University Press, 2021).

45 Rose observes that 'vitality is decomposed into a series of distinct and discrete objects—that can be isolated, delimited, stored, accumulated, mobilized, and exchanged, accorded a discrete value' (*The Politics of Life Itself*, p. 7).

contemporary culture. As Kristin Ferebee demonstrates in her reading of Jeff LeMire (chapter 8), the view of medical research as a process of anatomization, separation, and even as a form of ‘extraction’ comparable to the extractive practices of fossil fuel economies, is a key part of this century’s biological imagination.

Aesthetic Trends

The arguments gathered in this book suggest that epistemological and biopolitical questions are at work within aesthetic form itself. New labels have been proposed by artists and critics, signalling the appropriation of ecological and medical topics in ‘climate change art’, ‘neurofiction’, ‘syndrome novels’, ‘pandemic fiction’, but also the appearance of new forms of sensibility, such as ‘Anthropocene noir’, a feeling of disillusion, guilt and disempowerment that shares structural characteristics with the genre of *noir* fiction.⁴⁶ The possibility of deriving aesthetic form from unusual biological perspectives is highlighted in this volume by neologisms such as ‘mycoaesthetics’ (chapter 4) or ‘planttheater’ (chapter 13). Well-known forms, meanwhile, come under pressure. Familiar modes, such as the pastoral, are distorted by new environmental patterns, leading, for example, to the post-pastoral style of McGregor’s *Reservoir 13*. Old heroes, like the ‘ecological detective’ identified by Sara Crosby in Edgar Allan Poe’s writing,⁴⁷ return in new guises, in the narrative voices constructed by McGregor or VanderMeer. In Adam Dickinson’s poem *Anatomic*, the speaker’s own body is the object of his ecological detective work, as he seeks out the biochemicals and microbial life to which he is a host. Those findings inscribe the ‘industrial powers and evolutionary pressures’ of his time in the poet’s body, which becomes ‘a spectacular and horrifying crowd’.⁴⁸ Tracking the minute traces of all the ways in which a polluted world pollutes the body, Dickinson’s collection builds up, according to Hamann-Rose,

46 Deborah Bird Rose, ‘Anthropocene Noir’, *Arena Journal*, 41/42 (2014), 206–19.

47 Sarah Crosby, ‘Beyond Ecophilia: Edgar Allan Poe and the American Tradition of Ecohorror’, *Interdisciplinary Studies in Literature and Environment*, 21.3 (Summer 2014), 513–25 (p. 515), <https://doi.org/10.1093/isle/isu080>.

48 Adam Dickinson, *Anatomic* (Toronto: Coach House Books, 2018), p. 9.

an imaginary of ‘human environmental aesthetics as transformed by capitalist-industrial molecular writing’ (chapter 2).

A preference for the local, immersed or entangled view, and the tendency to destabilise anthropocentrism, are two recurrent features in the texts, images and performances studied here. Human agency is decentred by ecosystemic perspectives, which entangle it with the agencies of both living and non-living matter. The human subject itself is questioned by certain scales, when it becomes the object of neurological study, a partner in symbiotic association with microbial forces, or a site on which the polluted environment writes.⁴⁹ Such attempts to change perspectives may clash with inherited artistic forms, as when the cyclicity of biological phenomena resists the linearity of narrative (chapter 10). Though it has the advantage of being able to create physical encounters with other forms and places of life—notably trees, plants, and bacteria in the shows presented in this volume—theatre, like fiction, struggles with the ‘anthropocentric bias’ of its own medium.⁵⁰ As Shepherd-Barr and Simpson point out, realism ‘may be in part to blame’ for this focus on the human story (chapter 12). Faced with the challenges of microscopic and planetary scales, fantasy, weird fiction or science fiction sometimes seem better suited to the new biological imaginary. Certainly, realism has been the target of much criticism: Patrick Lonergan writes that theatrical ‘models of realism might be inhibiting our ecological awareness’, while Amitav Ghosh denounces the disjunction between a contemporary world in which the planetary plays an increasingly prominent role, and the conventional form of the Western novel, with its emphasis on the everyday and on individual consciousness.⁵¹ As Susan M. Squier

49 Through these pluralities and interdependencies, the destabilized human subjects described in this volume resonate with Rosi Braidotti’s definition of posthuman subjectivity as shifting the focus ‘from unitary to nomadic subjectivity’ within an ‘eco-philosophy of multiple belongings’ which, crucially, does not remove accountability (*The Posthuman*, Cambridge: Polity, 2013, p. 49).

50 For this idea in relation to narrative, see Monica Fludernik, *Towards a “Natural” Narratology* (Routledge, 1996), p. 9, <https://doi.org/10.4324/9780203432501>, and Marco Caracciolo, ‘Posthuman Narration as a Test Bed for Experientiality: The Case of Kurt Vonnegut’s *Galápagos*’, *Partial Answers*, 16.2 (2018), 303–14, <https://doi.org/10.1353/pan.2018.0021>.

51 Patrick Lonergan, ‘A Twisted, Looping Form: Staging Dark Ecologies in Ella Hickson’s *Oil*’, *Performance Research*, 25.2 (2020), 38–44 (p. 41), <https://doi.org/10.1080/13528165.2020.1752575>; Amitav Ghosh, *The Great Derangement: Climate Change and the Unthinkable* (Chicago: Chicago University Press, 2016).

and Ben De Bruyn's chapters demonstrate, however, even realist and graphic novels still play a key part in the search for relations to other-than-human life forms and imperceptible scales of being.

A number of ecocritics have argued that certain genres may be better suited than others to the representational challenges of ecological complexities. Following Greg Garrard and Susanna Lidström, Timothy Clark suggests that, because of poetry's ability to accommodate multiplicity, uncertainty, and ambiguity, 'the true complexity of environmental issues has been perhaps easier to represent in new or revised forms of poetic practice than in prose forms like the novel, short story or the non-fiction essay, or in theatre'.⁵² This volume, however, does not find one genre more suited to multi-scalar aesthetics than another. Rather than which genre, the key question is which forms may best attend to heterogeneous scales of life—individual and species, local ecosystem and planet, virus and host, cell and organism—and their disparate temporal scales, from the milliseconds of neural firing to the eons of geological periods. The narrative challenge of representing the scale of species has led historian Dipesh Chakrabarty to defend the necessity of 'multiple-track narrative',⁵³ and literary scholar David Herman to search for 'multiscale narration' in his work on 'bionarratology'.⁵⁴ Although he focuses on written narratives, many of the strategies that Herman identifies for 'storytelling at species scale' are relevant to other artistic forms. Allegory, for instance, and the multi-layered readings he refers to as 'allegorical laddering'⁵⁵—switching between individuals and species, allowing the reader to glimpse evolution and deep time—are equally vital to the environmental work of poets such as Gillian Clarke or Adam Dickinson, and indeed to the plotting of ecologically minded theatre

52 Clark, *The Value of Ecocriticism*, p. 59.

53 According to Chakrabarty, 'we will need to develop multiple-track narratives so that the story of the ontologically-endowed, justice-driven human can be told alongside the other agency that we also are—a species that has now acquired the potency of a geophysical force, and thus is blind, at this level, to its own perennial concerns with justice that otherwise forms the staple of humanist narratives'. (Dipesh Chakrabarty, 'Brute Force', *Eurozine* (2010), <https://www.eurozine.com/brute-force/>).

54 David Herman, 'Coda: Toward a Bionarratology; or, Storytelling at Species Scale', in *Narratology beyond the Human: Storytelling and Animal Life* (Oxford: Oxford University Press, 2018), pp. 249–94 (p. 252), <https://doi.org/10.1093/oso/9780190850401.001.0001>.

55 *Ibid.*, p. 263.

performances, even when little is left of 'dramatic' plot notions. Kris Verdonck's *Exote 1*, in which spectators wearing lab coats encountered the invasive species of Belgian landscapes, thus placed them in 'a planetary garden that they themselves have deregulated', as Beaufils points out, while EdgarundAllan's *Beaming Sahara* presented them with a block of soil 'speaking' on behalf of the forest (chapter 13).

Representing heterogeneous scales of being entails shifts, not only in the temporal and spatial dimensions of texts, images, and performances, but also in how we envisage causation, as we face systems whose complexity defy current scientific understanding. Largely distributed, recursive, multivalent causation resists representation. The aesthetic challenge is thus intertwined with the epistemological difficulties, and the political implications, of scale-related choices. In a graphic novel like Jeff Lemire's *Sweet Tooth*, the choice of whether to focus on microbes and virus-resistant DNA, or on the perspective of a young boy who innocently triggers a pandemic, or on a dwindling, guilty human species, will determine key questions of ethical responsibility. The awareness of events happening at imperceptible scales makes critical the question of how 'reality' is constituted: through tenuous, ongoing collaborations, controversies, and negotiations within political, artistic, and scientific communities, and through practices ranging from grant writing to field work, from lab experiments to international conferences. One key political question is what normative, political implications each scale of representation carries with it. The reduced scale of utopian narratives, as Vermeulen argues, may resist scalability and rely implicitly on the necessity of mass death. On the other hand, the focus on unusual scales may argue for a renewed politics of attention, working against the perceptual limitations of the human, the 'unavailability of emergent systemic behavior and multi-scalar patterns to immediate phenomenal experience'.⁵⁶

Artistic work may thus tread a fine line between adding to an ultimately numbing discourse of crisis,⁵⁷ or, on the contrary, contributing

56 Dürbeck and Hüpkes, 'The Anthropocene', p. 3.

57 Timothy Clark highlights the risk of 'stuplimity' in the face of our 'ongoing biodiversity crisis' (Clark, *The Value of Ecocriticism*, p. 13): this term was first proposed by Sianne Ngai in 'Stuplimity: Shock and Boredom in Twentieth-Century Aesthetics', *Postmodern Culture* 10.2 (2000), <https://doi.org/10.1353/pmc.2000.0013>.

to what Yves Citton calls an *Ecology of Attention*.⁵⁸ The affective dimension of the works studied here is no doubt a key to this possibility of attention. Scale may be mobilized to elicit certain affective responses: in Mary M. Talbot and Brian Talbot's graphic novel *Rain*, discussed here by Squier, the protagonist's distress when faced with a local flood leads her to confront the global reality of climate change. The local similarly becomes infused with feelings of vulnerability and fragility in Beaufils' account of *After A Life Ahead*, an installation where the deep time of geological excavations was juxtaposed with the scientific observation of cancer cells, bacteria, and larger aquatic organisms. Such multi-scalar aesthetics anchor the lives of individuals and communities in both regional terrains and global instability, confronting different timescales in a way that resonates with descriptions of the Anthropocene as an 'age of scalar uncertainty'.⁵⁹

Chapter Presentation

Section I, 'Invisible Scales', explores texts in which a biological imaginary—inspired by developmental biology, mycology or microbiology—connects microscopic, invisible scales of life to environmental questions. In 'Human Environmental Aesthetics: The Molecular Sublime and the Molecular Grotesque' (chapter 2), Paul Hamann-Rose examines the aesthetic categories brought into play by a microbiological imaginary. Drawing examples from popular biology, fiction and poetry, this chapter argues that the microscopic scales of genetics, biochemistry and microbial science tend to be represented through sublime and grotesque aesthetics. After revisiting the history of the concept, Hamann-Rose anchors his analysis in Burke's conception of the sublime which, unlike Kantian formulations, includes the 'wonders of minuteness' provoked by the discovery of life along a 'diminishing scale of existence, in tracing which the imagination is lost as well as the sense'. Burke's sublime can thus serve as a prism through which to approach contemporary visions of molecular and microbial life as

58 Yves Citton investigate the 'micropolitics' of attention and proposes to shift from the concept of an 'economy' of attention to that of an 'ecology' of attention, in *The Ecology of Attention*, trans. by Barnaby Norman (Cambridge: Polity, 2017).

59 Dürbeck and Hüpkes, 'The Anthropocene', pp. 1–2.

challenges to human subjectivity and agency. Hamann-Rose examines these aesthetics alongside the equally important ‘molecular grotesque’, which he conceptualizes in accordance with Mikhail Bakhtin and Susan Stewart’s definitions. Although both categories reveal porous boundaries between the human and the nonhuman, and between the body and the environment, the molecular grotesque emphasizes distortion and materiality. Hamann-Rose tests these aesthetic categories in close readings of Simon Mawer’s novel *Mendel’s Dwarf*, popular science books *I Contain Multitudes* and *Life on Man*, and Adam Dickinson’s poetry collection *Anatomic*. His analysis reveals recurrent images, such as the body-as-landscape or the ‘Gulliver trope’, and a shift, in the twenty-first century, towards an ecological microbial imaginary. While the sublime and the grotesque often coexist, he concludes that the latter combines environmental anxiety with more concrete imaginaries of microscopic materialities.

In chapter 3, ‘Still Life and Vital Matter in Gillian Clarke’s Poetry’, Sophie Musitelli guides us through the intricate relations between geological and biological images in the work of Welsh poet Gillian Clarke. Musitelli chooses a new materialist framework to illuminate the vitality of matter in Clarke’s most recent collections. Registering both the life of stone and the minerality of organisms, Clarke’s environmental poetry displays an acute awareness of the ‘incommensurable yet intersecting scales’ of rocks and organisms and of geological and biological time. Musitelli’s reading examines the role of medical imaging, cellular biology and epigenetics in these poetics, through key notions such as metamorphosis, fossilization, ontogeny and epigenetic landscapes. The poet’s interest in coexisting yet heterogeneous timescales explains why developmental biology has become a key scientific paradigm in her work, this chapter argues. The recent ‘environmental turn’ taken by her poetry answers the urgency of climate change awareness, and is nourished by scientific images attuned to heterogeneous scales of transformation and sedimentation. This overlap between geological and biological imaginations allows Clarke’s poems to perform the vitality of both organic and inorganic matter. Musitelli’s close reading of her work demonstrates how contemporary environmental poetry may be ‘both deeply postromantic, and uncannily close to new materialist thinking’.

The fourth chapter, 'Mycoesthetics: Weird Fungi and Jeff VanderMeer's *Annihilation*', examines the cultural representation of fungi in the context of global warming and digital modernity. Derek Woods pays close attention to the language through which fungi are described in science communication, and to the figurative role played by fungi themselves both in popular science and in fiction. He argues that the weirdness of fungi tends to be 'captured' by metaphors like the wood wide web, which indicate a new biological scale, but whose plant-centrism and enthusiasm for networks need critical attention. Woods presents mycoesthetics as a cultural field shaped both by this symbolic role of fungi and by the intrinsic, ontological weirdness of subterranean mycelial life. His analysis examines the weird as a category in literary studies, alongside reflections on ecological weirdness in twenty-first-century environmental humanities, which use fungi to figure 'ecological estrangement'. Using Jeff VanderMeer's *Southern Reach* novels as a case study, the chapter demonstrates that the fungal writing at the heart of VanderMeer's trilogy overlays network metaphors with a genomic imaginary. Woods remains attentive to the cultural origins of such images, noting that the horizontal image of a fungal 'web' reflects the mutual influence between cybernetics and ecology, and the importance of systems in twenty-first-century cultures of science. VanderMeer's fiction, in this analysis, is exemplary of an ambivalent mycoesthetics that uses fungi as figures of connectedness yet asks that we acknowledge their distinctive ontology. Woods goes on to examine the relatively recent emergence of the fungal kingdom as a third biological category, through which the plant/animal binary 'cracks open to yield a multiplicity—which is not to say an open-ended or unlimited diversity of categories'. A strong reading of mycoesthetics, he concludes, would read not only human, but also mycelial agency in the production of this emergent field, inviting us to imagine eco-formalist approaches to contemporary literary forms.

Section II, 'Neuro-medical imaging and diagnosis', investigates narrative forms that grapple with a contemporary neurobiological imaginary. In chapter 5, Pascale Antolin reviews recent literary criticism surrounding the emerging 'neuronovel', which she examines as a sub-genre of the 'syndrome novel'. 'To Be or Not to Be a Patient: Challenging Biomedical Categories in Joshua Ferris' *The Unnamed*' focuses on a narrative that introduces tension into the genre by refusing

to name the main character's condition. The lack of diagnosis leaves Ferris' character a 'medical orphan', whose sense of self is increasingly disrupted by an irresistible compulsion to walk. Antolin's close reading highlights the overlap of contemporary images—such as brain imaging devices—with older figures such as the body as a machine. Like many neuronovels, Ferris' satirical narrative resists materialist reductions of consciousness to a 'synaptic self' (LeDoux) or a 'neurochemical self' (Rose).⁶⁰ Antolin's analysis suggests, however, that *The Unnamed* has a much broader satirical resonance: a syndrome novel without a syndrome, it resists categorization and subverts an American 'corporate pastoral'. Although the main character initially stands for the 'normate', as defined by Garland Thomson,⁶¹ his condition turns him into a paradoxical figure, both over-abled and disabled. Among the many binaries challenged by the novel, the polarities of health and illness interact in unexpected ways with those of ability and disability, social inclusion and exclusion. Through an overview of the novel's critical reception, Antolin's reading also highlights several recent facets of 'Neuro Lit Crit'.

In 'Neurocomics and Neuroimaging in David B.'s *Epileptic* and Farinella and Roš's *Neurocomic*', Jason Tougaw analyses the aesthetics of graphic narratives inspired by neuroscience (chapter 6). The autobiographical memoir *Epileptic* and the popular science book *Neurocomic* both investigate what philosopher Phillip Levine calls *the explanatory gap*, the resistance of immaterial experiences—such as consciousness or subjectivity—to neurobiological explanations. Like Susan M. Squier in chapter 11, Tougaw asks what specific tools graphic narratives can bring to the epistemological challenges they explore. According to Versaci, Chute or DeKoven, the medium foregrounds representation by refusing 'a problematic transparency'.⁶² Tougaw accordingly contrasts graphic narratives, which 'make meaning by

60 See Joseph LeDoux, *Synaptic Self: How Our Brains Become Who We Are* (New York: Penguin, 2002) and Nikolas Rose, 'Neurochemical Selves', *Society*, 41 (2003), 46–59, <https://doi.org/10.1007/BF02688204>.

61 Rosemarie Garland Thomson, *Extraordinary Bodies: Figuring Physical Disability in American Culture and Literature* (New York: Columbia University Press, 2017), p. 8.

62 Rocco Versaci, *This Book Contains Graphic Language: Comics as Literature* (New York: Bloomsbury Academic, 2007), p. 6; Hillary Chute and Marianne DeKoven, 'Introduction: Graphic Narrative', *Modern Fiction Studies*, 52.4 (2006), 767–82 (p. 767), <https://doi.org/10.1353/mfs.2007.0002>.

inviting readers into the representational process', with the tendency, in science journalism and popular science, to present the visual products of brain scanning technologies like PET, SPECT and fMRI as 'seductively transparent'⁶³ images of neural activity. *Neurocomic* combines textbook images with fantasy, including 'a shrinking man' who wanders through the forest of his own brain, recalling the 'Gulliver trope' noticed by Hamann in popular microbiology (chapter 2). *Epileptic* also mingles realism and fantasy, representing the tests and treatments endured by the author's brother in images that ironically emphasize the brain's resistance to representation. Graphic narratives, Tougaw concludes, demonstrate that meta-representation is one of literature's key contributions to contemporary understandings of the brain.

Section III examines how pandemic imaginaries, deployed in three fictions published between 2009 and 2018 (*Severance*, *Sweet Tooth* and *Station Eleven*), rearrange narratives of daily life within urban, regional, and continental spaces and history. By following their protagonists as they navigate post-catastrophe, depopulated storyworlds, these chapters invite us to question the demographic ideology and positivist ontology that dominated a certain Modern, colonial, extractivist and racist worldview. They thus shed light on how infectious diseases and microbial agents shape contemporary literary representations of life and human community, situating utopia within specific scales of belonging, existence, and population.

During the COVID-19 spring of 2020, quasi pastoral images of streets left to deer and foxes proliferated. But not all human urbanites had been able to flee to greener pastures. In 'The Fiction of the Empty Pandemic City: Race and Diaspora in Ling Ma's *Severance*' (chapter 7), emergency medicine physician and literary scholar Rishi Goyal unveils the biopolitical structuring of such images. He shows how, from Daniel Defoe's fictionalized account of the 1665 great plague of London (*Journal of the Plague Year*, 1722) to Ling Ma's pandemic novel *Severance* (2018)—in which a global fungal infection depopulates the streets of New York, abandoning them to plants, Hispanic cabdrivers and the Chinese-American protagonist—literary depictions of the city in times of spreading disease re-negotiate spatial politics. According to

63 N. Katherine Hayles, 'Brain Imaging and the Epistemology of Vision: Daniel Suarez's *Daemon* and *Freedom*', *Modern Fiction Studies*, 61.2 (2015), pp. 320–34 (p. 322).

Goyal, *Severance* can be read as re-activating a twentieth-century history of 'white flights' during which American downtowns saw their white population leave neighbourhoods as racialized communities settled in. The novel's 'empty pandemic city' moreover questions the melancholic role of Asian-Americans in the national narrative, and that of nostalgia in diasporic and immigrant identity formation. Pandemic fiction is revealed as a stage on which we can contemplate the invisibilization of racialized communities, their relegation to the domain of expendable life by an urban cartography that erases social inequalities. By redrawing this very cartography, *Severance* invites a recalibration of how the American community imagines itself.

In Jeff Lemire's graphic novel series *Sweet Tooth* (2009–2013), a pandemic also makes room for a world in which the history of unequal relations between cultures is re-envisioned. The novel depicts how a mysterious plague—brought about by the white European excavation of an indigenous burial ground—destroys civilization and leaves the Earth to human-animal hybrid children, and to Tekkeitsertok and his fellow Inuit gods. In chapter 8, 'Dead Gods and Geontopower: An Ecocritical Reading of Jeff Lemire's *Sweet Tooth*', Kristin Ferebee reads this narrative, through the prism of indigenous epistemology, as a critique of extractive capitalism. She describes how the European colonization of North America has exercised what anthropologist Elizabeth Povinelli has called 'geontopower', a 'settler ontology' that has sidelined indigenous animist knowledge, establishing well-guarded borders between Life and Nonlife, and devitalizing geophysical entities to better exploit them. Disrupting such geontopower, *Sweet Tooth's* plague—microscopic in its elements, macroscopic in its reach—foregrounds modes of relationality (the co-existence, rather than assimilation of Inuit and Western ontologies) that Ferebee understands through Karen Barad's onto-epistemology. She demonstrates how the comic portrays the life of its hybrid characters as enmeshed with the god-like entities animating the North American landscape and fossil underground, in a 'disaggregated' way that does not erase the difference of the conjoined parts, a compositional 'partedness' that also marks Lemire's visual and narrative choices.

A pandemic similarly plays a crucial, somehow emancipatory role in Emily St. John Mandel's *Station Eleven* (2014), a novel in which a troupe composed of survivors of a flu that killed most of the Earth's population

travels across the North American Great Lakes region, performing Shakespeare's plays to the communities slowly recomposing in the ruins of our present civilisation. This representation of a relatively bucolic post-apocalyptic life is, according to Pieter Vermeulen's 'Depopulating the Novel: Post-Catastrophe Fiction, Scale, and the Population Unconscious' (chapter 9), burdened with scalar politics in which the good life is defined against fears of overpopulation, and so hinges on a drastic demographic reduction. Such reduction, Vermeulen argues, is unproblematised in *Station Eleven*, as it is in much post-catastrophe fiction, an increasingly popular genre he situates within the literary genealogies of utopian fiction, science fiction, and the realist novel. Tracing these genealogies, he unearths the genre's Malthusian foundations and shows how the 'cosy catastrophe' subgenre (identified by science fiction writer Brian Aldiss in 1973)⁶⁴ responds to fears of environmental exhaustion and planetary overcrowding with fantasies of a world made beautiful again by the removal of excess population. By exploring the normative scales of utopian, realist, and science fiction, Vermeulen invites us to reconsider how literary representations of proliferating life intersect with contemporary population politics.

The fourth and final section of *Life Re-Scaled* turns toward the representational challenges posed by climate change and the planetary ecological crisis. It explores how novels, graphic narratives, theatre, and performance have developed an array of strategies to engage with the spatial and temporal scales of animal, vegetal and microbial life alongside geophysical phenomena. These scales call for a renewal of narrative, visual and theatrical forms, in which the human is regularly decentred or inextricably enmeshed in the thick materiality of ecosystems. The section opens with 'The Everyday Pluriverse: Ecosystem Modelling in *Reservoir 13*', in which Ben De Bruyn explains how Jon McGregor's 2017 novel, which depicts thirteen years in the seasonal life of an English village, succeeds in evoking a rural mesocosm (located between, yet gesturing towards, micro- and macro- ecological scales), by combining the multiple perspectives of vegetal, insect and animal species (including humans), without subsuming them in an anthropocentric narrative. Reviewing existing scholarship on post-pastoral aesthetics, De Bruyn

64 Brian Aldiss, *Billion Year Spree: The History of Science Fiction* (London: Weidenfeld and Nicolson, 1973), pp. 315–16.

locates McGregor's novel within emerging strands of realism that train us to pay closer attention to the biological cycles surrounding us, such as reproduction and predation, bird migrations and plant flowering. The renewed attention given to cyclical phenomena manifests itself notably through *Reservoir 13's* experimentation with repetition and variation, formal strategies that participate in its ecosystem modelling. For De Bruyn, we should then consider the novel as a fully-fledged technique for capturing, logging, and modelling nonhuman lives and environmental processes, comparable to the selected photographs (Stephen Gill's, collected in *Night Procession* and *The Pillar*), maps and diagrams (James Cheshire and Oliver Uberti's *Where the Animals Go*) or citizen science projects (Akiko Busch's *The Incidental Steward*) he discusses. Reflecting on the affordances of mesocosmic storyworlds for ecological storytelling, the chapter engages with concepts such as the 'ecological detective' and 'ecosticism', and defends the value of narratives that represent familiar phenomena in a more scale-sensitive manner.

In the following chapter, 'The Narrative and Aesthetic Strategies of Climate Change Comics' (chapter 11), Susan M. Squier examines the potential of graphic narrative as a medium to tackle the challenge of representing climate change. Drawing from a range of recent European and American examples, Squier identifies scale-switching as a recurrent narrative structure: these comics alternate between the small scale of individual lives, and the large-scale complexities of climate change. Those complexities are conveyed by scientific discourses and images connecting global warming to biological realities perceivable by human characters, including biodiversity loss, extinction, and medical impacts on health and development. The comics under study in this chapter often choose unexpected perspectives, focusing, for instance, on the less charismatic species threatened by dwindling food chains, rather than on charismatic megafauna usually foregrounded by the discourse of extinction.⁶⁵ They also highlight the correspondence between socio-economic vulnerability and exposure to the hazards of a warmer climate, in particular the less well-known medical and epigenetic risks of increasingly toxic environments. Approaching climate change as a hyperobject, Squier demonstrates how the challenge

65 See Heise, *Imagining Extinction*.

it poses to representation may be answered through strategies such as anthropomorphism, synecdoche, and the combination of scientific distance with personal experience. The chapter presents the combination of narrative and image specific to comics as a tool able to tackle the collective 'failure of imagination' that threatens to plague twenty-first-century approaches to environmental crisis.

The possibility of countering such a 'failure of imagination' on the theatre stage is investigated by Kirsten E. Shepherd-Barr and Hannah Simpson in the twelfth chapter: 'Displacing the Human: Representing Ecological Crisis on Stage'. According to Shepherd-Barr and Simpson, theatre faces specific challenges when exploring the domain of ecological forces, but it also has powerful tools at its disposal thanks to its capacity to function in a range of spatial, temporal, and sensory dimensions. Reviewing earlier, twentieth-century stagings of creatures such as sentient plants (by Susan Glaspell, Alan Menken and Howard Ashman) and microbes (by George Bernard Shaw), or of posthuman landscapes and depersonalised beings (by Maeterlinck and Beckett), they describe how theatre has striven to depart from human concerns and onstage presence. They then guide us through the formal tools developed by contemporary theatre-makers to engage with the more-than-human scales of climate change and biological extinction. Among these tools, we find the use of miniature ecosystems to represent geological forces, exemplified by a fish tank in Steve Waters' *The Contingency Plan* (2009); the writing of 'unrepresentable' scales into interscenes, such as '*A million newborn babies gasp for breath*', in Hickson's *Oil* (2016); the dispersion, replicability and viral quality of the performances created by Earth Ensemble, the protean troupe associated with activist movement Extinction Rebellion; or the intermixing of media and discourses, factual or false, scientific or mythical, about endangered animal lives in Deke Weaver's *The Unreliable Bestiary* (2009–...). These strategies are here discussed alongside emerging dramatic genres such as the 'dramatised lecture', centred on experts (Emmott, Rapley and Latour), or Earth Ensemble's 'guerrilla theatre'; two different yet perhaps complementary responses to the insistent reality of ecological upheaval.

In our collection's final chapter, Eliane Beaufils focuses on the immersive installations and scenography through which four contemporary productions (Kris Verdonck's *Exote I*, Pierre

Huyghe's *After ALife Ahead*, Tobias Rausch's *Die Welt Ohne Uns*, and EdgarundAllan's *Beaming Sahara*) convert theatre into a milieu in which spectators are invited to experience their entanglement with other-than-human biological and geological scales. 'Staging Larger Scales and Deep Entanglements: The Choice of Immersion in Four Ecological Performances' discusses how these shows may act as 'diplomats' mediating between humans and ecological domains, by mobilizing a multiplicity of human and nonhuman 'actors' linked by scalar interdependencies. Such mediation takes a variety of shapes: close encounters with the unexpected disruptions created by tourism and commercial exchanges in local and global ecosystems; an installation where the main life forms are aquatic and microscopic, suggesting a future when humans will no longer be *anthropoi*; a 'longterm planttheater', performed over a year and a half in a botanical garden; an encounter with forests, minerals, and ice as hyperactors (as opposed to hyperobjects). These performances create ambiances of fragility and mourning, but also produce vital curiosity and the desire to 'read' other-than-human life through the proximity they allow with biological or abiotic entities. Attentive to the differences between different forms of immersion, Beaufils analyses the epistemological and affective implications of their uses of separation, close-up, darkness, and sensory stimulation, asking how they might enable a 'becoming with'.⁶⁶ In response to the crisis of sensibility that enables 'physiocide' in the Anthropocene,⁶⁷ Beaufils argues that immersive practices have specific affordances that enable spectators to think 'geobiologically'.

Through its twelve chapters, *Life, Re-Scaled* provides an impression of contemporary American and European literature and performance's engagements with the biological, revealing a common emphasis on interactions between scales and concerns with environmental justice; a desire to encounter animal, vegetal and microbial lives; and a critical engagement with the life sciences and with associated Western ontologies. Through the diversity of genres it studies, this collective

66 Donna J. Haraway, *When Species Meet* (Minneapolis and London: University of Minnesota Press, 2008), p. 244.

67 On 'physiocide' as the murder of the vegetal world, see Iain Hamilton Grant, 'Everything Is Primal Germ or Nothing Is: The Deep Field Logic of Nature', *Symposium: Canadian Journal of Continental Philosophy*, 19.1 (2015), 106–24, <https://doi.org/10.5840/symposium20151919>.

investigation hopes to contribute to a decisive effort, in the arts and humanities of the twenty-first century, to renew relations with the living matter that composes and surrounds us.

Works Cited

- Aït-Touati, Frédérique and Bruno Latour, *Inside* (2017), <http://www.bruno-latour.fr/node/755.html>
- Albrecht, Glenn, 'Solastalgia: The Distress Caused by Environmental Change', *Australasian Psychiatry*, 15 (2007), 95–98, <https://doi.org/10.1080/10398560701701288>
- Aldiss, Brian, *Billion Year Spree: The History of Science Fiction* (London: Weidenfeld and Nicolson, 1973).
- Arènes, Alexandra, Bruno Latour, and Jérôme Gaillardet, 'Giving Depth to the Surface: An Exercise in the Gaia-Graphy of Critical Zones', *The Anthropocene Review*, 5.2 (2018), 120–35, <https://doi.org/10.1177/2053019618782257>
- Baptiste, Eric et al., 'The Epistemic Revolution Induced by Microbiome Studies: An Interdisciplinary View', *Biology*, 10.7 (2021), 651, <https://doi.org/10.3390/biology10070651>
- Beauregard-Racine, Julie et al., 'Of Woods and Webs: Possible Alternatives to the Tree of Life for Studying Genomic Fluidity in *E. coli*', *Biology Direct*, 6.39 (2011), <https://doi.org/10.1186/1745-6150-6-39>
- Beer, Gillian, 'Preface to the Second Edition', in *Darwin's Plots: Evolutionary Narrative in Darwin, George Eliot and Nineteenth-Century Fiction* (Cambridge: Cambridge University Press, 1983, 2000), pp. xvii–xxxii.
- Bendell, Jem, 'Deep Adaptation: A Map for Navigating Climate Tragedy' (2018, 2020), <http://lifeworth.com/deepadaptation.pdf>
- Bird Rose, Deborah, 'Anthropocene Noir', *Arena Journal*, 41/42 (2014), 206–19.
- Braidotti, Rosi, *The Posthuman* (Cambridge: Polity, 2013).
- Caracciolo, Marco, 'Posthuman Narration as a Test Bed for Experientiality: The Case of Kurt Vonnegut's *Galápagos*', *Partial Answers*, 16.2 (2018), 303–14, <https://doi.org/10.1353/pan.2018.0021>
- Carson, Rachel, *Silent Spring* (Boston: Houghton Mifflin, 1962).
- Chakrabarty, Dipesh, 'Brute Force', *Eurozine* (2010), <https://www.eurozine.com/brute-force/>
- Chute, Hillary and Marianne DeKoven, 'Introduction: Graphic Narrative', *Modern Fiction Studies*, 52.4 (2006), 767–82, <https://doi.org/10.1353/mfs.2007.0002>

- Citton, Yves, *The Ecology of Attention*, trans. by Barnaby Norman (Cambridge: Polity, 2017).
- Clark, Timothy, *The Value of Ecocriticism* (Cambridge: Cambridge University Press, 2019), <https://doi.org/10.1017/9781316155073>
- Coccia, Emanuele, *The Life of Plants: A Metaphysics of Mixture* (Hoboken: Wiley, 2018).
- Crosby, Sarah, 'Beyond Ecophilia: Edgar Allan Poe and the American Tradition of Ecohorror', *Interdisciplinary Studies in Literature and Environment*, 21.3 (Summer 2014), 513–25, <https://doi.org/10.1093/isle/isu080>
- DeLoughrey, Elizabeth, 'The Myth of Isolates: Ecosystem Ecologies in the Nuclear Pacific', *Cultural Geographies*, 20.2 (2013), 167–84, <https://doi.org/10.1177/1474474012463664>
- Despret, Vinciane and Michel Meuret, 'Cosmoecological Sheep and the Arts of Living on a Damaged Planet', *Environmental Humanities*, 8.1 (2016), 24–36, <https://doi.org/10.1215/22011919-3527704>
- Dickinson, Adam, *Anatomic* (Toronto: Coach House Books, 2018).
- Dürbeck, Gabriele and Philip Hüpkes, 'The Anthropocene as an Age of Scalar Complexity', in *Narratives of Scale in the Anthropocene: Imagining Human Responsibility*, ed. by Gabriele Dürbeck and Philip Hüpkes (New York: Routledge, 2022), 1–20, <https://doi.org/10.4324/9781003136989>
- Falleti, Clelia, Gabriele Sofia, and Victor Jacono, eds, *Theatre and Cognitive Neuroscience* (London: Bloomsbury, 2016).
- Fludernik, Monica, *Towards a "Natural" Narratology* (London: Routledge, 1996), <https://doi.org/10.4324/9780203432501>
- Foucault, Michel, *Histoire de la sexualité I : La volonté de savoir* (Paris: Gallimard, 1976).
- Foucault, Michel, *The History of Sexuality, Volume 1: An Introduction*, trans. by Robert Hurley (New York: Vintage, 1990).
- Garland Thomson, Rosemarie, *Extraordinary Bodies: Figuring Physical Disability in American Culture and Literature* (New York: Columbia University Press, 2017).
- Gill, Josie, *Biofictions: Race, Genetics and the Contemporary Novel* (London: Bloomsbury, 2020), <https://doi.org/10.5040/9781350099869>
- Ghosh, Amitav, *The Great Derangement: Climate Change and the Unthinkable* (Chicago: Chicago University Press, 2016).
- Hamilton Grant, Iain, 'Everything is Primal Germ or Nothing Is: The Deep Field Logic of Nature', *Symposium: Canadian Journal of Continental Philosophy*, 19.1 (2015), 106–24, <https://doi.org/10.5840/symposium20151919>

- Hanson, Claire, *Genetics and the Literary Imagination* (Oxford: Oxford University Press, 2020), <https://doi.org/10.1093/oso/9780198813286.001.0001>
- Haraway, Donna J., *When Species Meet* (Minneapolis and London: University of Minnesota Press, 2008).
- Haraway, Donna J., *Staying with the Trouble: Making Kin in the Chthulucene* (Durham: Duke University Press, 2016), <https://doi.org/10.1215/9780822373780>
- Hawkins, Anne H., 'Pathography: Patient Narratives of Illness', *Western Journal of Medicine*, 171.2 (1999), 127–29.
- Hayles, N. Katherine, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago: University of Chicago Press, 1999).
- Hayles, N. Katherine, 'Brain Imaging and the Epistemology of Vision: Daniel Suarez's *Daemon* and *Freedom*', *Modern Fiction Studies*, 61.2 (2015), 320–34.
- Heise, Ursula K., *Sense of Place and Sense of Planet: The Environmental Imagination of the Global* (Oxford: Oxford University Press, 2008), <https://doi.org/10.1093/acprof:oso/9780195335637.001.0001>
- Heise, Ursula K., *Imagining Extinction: The Cultural Meanings of Endangered Species* (Chicago: University of Chicago Press, 2016), <https://doi.org/10.7208/chicago/9780226358338.001.0001>
- Hendrickx, Sébastien and Kristof van Baarle, 'Décor as Protagonist: Bruno Latour and Frédérique Aït-Touati on Theatre and the New Climate Regime', *The Theatre Times* (18 February 2019), <https://thetheatretimes.com/decor-is-not-decor-anymore-bruno-latour-and-frederique-ait-touati-on-theatre-and-the-new-climate-regime/>
- Herman, David, 'Coda: Toward a Bionarratology; or, Storytelling at Species Scale', in *Narratology beyond the Human: Storytelling and Animal Life* (Oxford: Oxford University Press, 2018), 249–94, <https://doi.org/10.1093/oso/9780190850401.001.0001>
- Holton, Gerald, 'On the Art of Scientific Imagination', *Daedalus* 125.2 (Spring 1996), 183–208.
- Horton, Zachary, *The Cosmic Zoom: Scale, Knowledge, and Mediation* (Chicago: University of Chicago Press, 2021), <https://doi.org/10.7208/chicago/9780226742588.001.0001>
- Houser, Heather, *Infowhelm: Environmental Art and Literature in an Age of Data* (New York: Columbia University Press, 2020).
- Huxley, Julian, *Evolution: The Modern Synthesis* (London: Allan & Unwin, 1942).
- Idema, Tom, *Stages of Transmutation: Science Fiction, Biology, and Environmental Posthumanism* (London: Routledge, 2019).
- Kress, W. John and Gary W. Barrett, eds, *A New Century of Biology* (London: Penguin Random House, 2016).

- Kucukalic, Lejla, *Biofictions: Literary and Visual Imagination in the Age of Biotechnology* (New York: Routledge, 2021), <https://doi.org/10.4324/9781003132325>
- Levine, Caroline, 'Model Thinking: Generalization, Political Form, and the Common Good', *New Literary History*, 48.4 (2017), 633–53, <https://doi.org/10.1353/nlh.2017.0033>
- Latour, Bruno, *Facing Gaia*, trans. by Catherine Porter (Cambridge: Polity Press, 2017).
- LeDoux, Joseph, *Synaptic Self: How Our Brains Become Who We Are* (New York: Penguin, 2002).
- Loneragan, Patrick, 'A Twisted, Looping Form: Staging Dark Ecologies in Ella Hickson's *Oil*', *Performance Research*, 25.2 (2020), 38–44, <https://doi.org/10.1080/13528165.2020.1752575>
- Ngai, Sianne, 'Stuplimity: Shock and Boredom in Twentieth-Century Aesthetics', *Postmodern Culture*, 10.2 (2000), <https://doi.org/10.1353/pmc.2000.0013>
- Meeker, Natania and Antónia Szabari, *Radical Botany: Plants and Speculative Fiction* (New York: Fordham University Press, 2019), <https://doi.org/10.5422/fordham/9780823286638.001.0001>
- Morton, Timothy, 'The Dark Ecology of Elegy', *The Oxford Handbook of the Elegy*, ed. by Karen Weisman (Oxford: Oxford University Press, 2010), 251–71, <https://doi.org/10.1093/oxfordhb/9780199228133.013.0015>
- Morton, Timothy, *Hyperobjects: Philosophy and Ecology After the End of the World* (Minneapolis: University of Minnesota Press, 2013).
- Povinelli, Elizabeth, *Geontologies: A Requiem to Late Liberalism* (Durham: Duke University Press, 2016), <https://doi.org/10.1215/9780822373810>
- Puchner, Martin, *Literature for a Changing Planet* (Princeton: Princeton University Press, 2022).
- Purdy, Jedediah, 'Thinking Like a Mountain', *N+1*, 29 (2017), <https://nplusonemag.com/issue-29/reviews/thinking-like-a-mountain/>
- Rose, Nikolas, 'Neurochemical Selves', *Society*, 41 (2003), 46–59, <https://doi.org/10.1007/BF02688204>
- Rose, Nikolas, *The Politics of Life Itself* (Princeton: Princeton University Press, 2007).
- Shepherd-Barr, Kirsten E., *Theatre and Evolution from Ibsen to Beckett* (New York: Columbia University Press, 2015).
- Solnick, Sam, *Poetry and the Anthropocene: Ecology, Biology and Technology in Contemporary British and Irish Poetry* (New York: Routledge, 2016), <https://doi.org/10.4324/9781315673578>

- Spillers, Hortense, 'Mama's Baby, Papa's Maybe: An American Grammar Book', *Diacritics*, 17.2 (1987), 64–81, <https://doi.org/10.2307/464747>
- Thompson, Evan, *Mind in Life: Biology, Phenomenology and the Sciences of Mind* (Cambridge, MA: Harvard University Press, 2007).
- Tougaw, Jason, *The Elusive Brain: Literary Experiments in the Age of Neuroscience* (New Haven: Yale University Press, 2018).
- Venter, Craig and Daniel Cohen, 'The Century of Biology', *New Perspectives Quarterly*, 21 (2004), 73–77, <https://doi.org/10.1111/npqu.11423>
- Versaci, Rocco, *This Book Contains Graphic Language: Comics as Literature* (New York: Bloomsbury Academic, 2007).
- Vesna, Victoria, ed., *Database Aesthetics: Art in the Age of Information Overflow* (Minneapolis: University of Minnesota Press, 2007).
- Vint, Sherryl, *Biopolitical Futures in Twenty-First-Century Speculative Fiction* (Cambridge: Cambridge University Press, 2021), <https://doi.org/10.1017/9781108979382>
- Woods, Derek, 'Scale Critique for the Anthropocene', *Minnesota Review*, 83 (2014), 133–42, <https://doi.org/10.1215/00265667-2782327>
- Woods, Derek, 'Scale in Ecological Science Writing', *Routledge Handbook of Ecocriticism and Environmental Communication*, ed. by Scott Slovic, Swarnalatha Rangarajan, and Vidya Sarveswaran (Oxon: Routledge, 2020), 118–28, <https://doi.org/10.4324/9781315167343-11>
- Wynter, Sylvia, 'Unsettling the Coloniality of Being/Power/Truth/Freedom: Towards the Human, After Man, Its Overrepresentation—An Argument', *The New Centennial Review*, 3.3 (Fall 2003), 257–337, <https://doi.org/10.1353/ncr.2004.0015>

