Debjani Ganguly

The Scale of Realism in the Global Novel

This essay explores nested scales of realism in the contemporary global novel as this form confronts cataclysmic technological and environmental changes. We are now witnessing a fundamental mutation both in the modern realist mode and the modern conception of the human. The figure of the human is perceived as increasingly entangled in and co-produced by biochemical, technological, and geological phenomena. Marx's idea of the *social*, reprised by Lukács and Durkheim in the twentieth century, has begun to be reformulated in Latourian terms to include not just human actors, but non-human species, material and technological agents or *actants*. The idea of an unbroken human evolution into an infinite future is seriously challenged by climatologists and scholars of artificial intelligence. What the philosophical and theoretical ground of humanism now is as urgent a question as it has been since the sixteenth century. Marx's and Lukács' idea of human exceptionalism is located in the sphere of modern history with the rise of Europe in the sixteenth century and the global advancement of industrial capitalism through the colonial era. One remembers Georg Lukács' Marx-inspired account of history as a progress of the human species whose three features include an unbroken upward evolution of mankind into an endless future; the complete human personality; and the "organic, indissoluble connection between man as a private individual and man as a social being" (Lukács 1950, 8). The Hegelian idea of *Gattungswesen*, a species-being thoroughly in itself and for itself, constitutes the bulwark of such theory. What we find in Lukács' work is a modern epistemology of human exceptionalism: that is, the human is specifically *not* animal or thing or machine. The realist novel is the genre in which this exemplary human figure takes aesthetic shape. Our post-War histories of postcolonial transformation and globalisation are a continuation of this modern and deeply humanist literary paradigm.

Climate historians talk of two other histories that now press against this human-centred history: the history of the earth system (earth sciences), and the history of life including that of human evolution on the planet (life sciences). "Humans," Dipesh Chakrabarty notes, "now unintentionally straddle these three histories that operate on different time scales and at different speeds. The very language through which we speak of the climate crisis is shot through with this problem of the human and nonhuman scales of time" (Chakrabarty 2014, 1). Eugene Thacker's philosophical tract, *In the Dust of this Planet* is pertinent here for it explores the power of speculative genres, particularly supernational horror, in grasping the cascading climatological and geological disasters of our era. In parallel

https://doi.org/10.1515/9783110740301-006

with Chakrabarty's three historiographical scales, Thacker identifies three forms of world-making that impinge on each other today: world-for-us (the humanist realm), world-in-itself (the earth with its myriad lifeforms), and world-without-us (the planet). He conceives this last in both speculative and spectral terms, as something that haunts us as even as it inhabits a zone of speculative fabulation. The world-without-us, notes Thacker, lies "in a nebulous zone that is at once impersonal and horrific . . . [it is] a dark intelligible abyss that is paradoxically manifest as the World and the Earth" (Thacker 2011, 6–8). Such a perspective invites us to confront not only the non-human foundations of life on earth, but also the radical alterity of Earth as a planet that existed before us and will last beyond our species. Representations of human form and agency clearly appear to be on the threshold of colossal transformations – technological, chemical, biomedical, geological, and planetary – scarcely conceivable in the era of scientific enlightenment and industrial capitalism of the eighteenth and nineteenth centuries; and the post-industrial era since World War Two. Ian Baucom's dramatic words capture this transformation powerfully: "Entangled with the screen, entangled with nonhuman biotic forms of life, entangled with data, entangled with surging oceans, entangled with equity bundles, entangled with the geological, entangled with algorithms, entangled with gene-coding, entangled with sun flares, entangled with derivatives – the human in the epoch of the contemporary . . . can no longer be imagined to hold its humanist core" (Baucom 2020, 26).

The problem of scale has emerged as a site of scholarly contention and deliberation, one that is of particular relevance to thinking the realist novel.[1] The issue I address in this essay is one of temporality, form, and magnitude of human experience and the problem of their plausible representation in realist novels. While I am aware of an emerging *new formalist* scholarship on scale, my focus here is on the ontological upending of the realist novel's humanist ground by megascale nonhuman forces.[2] "The scale of human observation and experience," notes evolutionary biologist, D'Arcy Wentworth Thompson, "lies within the narrow bounds of inches, feet and miles, all measured in terms drawn from our selves or our own doings. Scales that include light-years, parsecs, Angstrom units or atomic and subatomic magnitudes, belong to other order of things and other principles of cognition" (Thompson 1992, 17). The realist novel that has hitherto been ensconced in a plausible empirical realm attuned to human-scale cognition and sensory world, is now compelled to reckon with scalar variations in "modern terraforming assemblages," to use Derek Wood's words, that are non-anthropocentric, where the

1 See Ghosh (2016 "Stories"); McGurl (2017); Heise, (2016); Ganguly (2020).

2 For a formal analysis of scale, I recommend Caracciolo (2021).

human subject is one among a multitude of nonhuman agents such as animals, insects, atmosphere, water, earth, and technology (Woods 2014, 138). Moving from the individuated human to the assemblage is not just a matter of a linear movement from the micro (biographical) to the macro (planetary), but of reckoning with their unpredictable enjambment, nonlinear juxtaposition, dramatic jumps, and discontinuities. As Wood puts it: "What is needed to accommodate scale variance is a horizontal assemblage theory of the relations among humans, nonhuman species and technics rather than a vertical, phylogenetic account that traces all causal chains back to the embodied intelligence of *Homo Sapiens*" (138).

The scale of the *global* undergoes a shift too. Founded primarily on the idea that the world can be perceived as a single interconnected whole, the global in the post-War era has drawn its conceptual valence from a world-systems model based on the entanglement of political economy, media and technological infrastructures, and mega-scale socio-cultural shifts. In recent years, the idea of the global has been compelled to reckon with geobiophysical systems that are planetary in scale. The global fossil-fuel economy and global warming now feed on each other. In the words of the historian of science, Paul N. Edwards, this planetary dynamic of the global is "intricately interconnected, articulated, evolving, but ultimately fragile and vulnerable." He goes on to add: "Network rather than hierarchy; complex interlocking feedbacks rather than central control; ecology rather than resource; these are the watchwords of the new habit of mind" (Edwards 2010, 2). What bearing might these insights have on the scale of realism in the global novel?

My essay explores questions of scale in relation to two realist modes: formal realism and planetary realism. By formal realism I mean the novel's correspondence with an extra-diegetic world that serves as a plausible documentary evidence of the novel's thick description of quotidian worlds focussed on individual lives and subjective experience. In the history of the modern English novel such evidence has typically consisted of a plethora of facts and factual genres: newspapers, historical archives, legal briefs, medical autopsy reports, book-keeping ledgers, readily identifiable socio-cultural practices of ordinary people, and a period's infrastructure and built environment.[3] What, I ask, now constitutes the ground of

3 The term "formal realism" was proposed by Ian Watt in his classic study, *The Rise of the Novel*, to account for the emergence of the eighteenth century English novel. Essays in *The Cambridge Companion to the Eighteenth Century Novel* by leading novel theorists Paul Hunter, Claude Rawson, and Maximillian Novak broadly agree that despite the apparent heterogeneity of novels produced in that century, almost all display typical features of formal realism: deep focus on the particularities of everyday life and subjective experience, recognizable conventions of behaviour, and a sense of immediacy as unprocessed circumstance.

formal realism when the very meaning of quotidian human life is shot through with geophysical phenomena – pandemics, floods, wildfires – appearing at a scale and intensity that upends notions of the ordinary and the everyday? How might one reckon with the gap between the multitude affected by such geophysical upheaval and the subjectivity of individuated lives that is the traditional focus of formal realism? I explore these questions by juxtaposing Lawrence Wright's *The End of October* (2020) with an eighteenth century novel, Daniel Defoe's *A Journal of the Plague Year* (1722). By planetary realism I mean the impingement of nonhuman forces on the novelistic imagination that insights from earth systems science, oceanography, geology, and information technology bring to the fore. Scientific imagination at this scale has not typically featured in theories of realism until recent advancements in techno-planetary modes of apprehension have made us aware of the staggering scale of catastrophes that engulf the globe. "The representational challenges are acute," writes Rob Nixon in his pathbreaking book *Slow Violence*, for novels now confront "catastrophic acts that are low in instant spectacle but high in long-term effects." Such acts demand an unprecedented degree of legibility and aesthetic labour for they can only be made "apprehensible to the senses through the work of scientific and imaginative testimony" (Nixon 2011, 10). What might such apprehension entail for a contemporary novelist? What are its literary prehistory and philosophical ground? I seek to answer these questions by exploring Amitav Ghosh's *Gun Island* (2019) and Namwalli Serpell's *The Old Drift* (2019).

1 Technosphere, Formal Realism, and Speculative Mode

> It was now the beginning of August, and the plague grew very violent and terrible in the place where I lived, and Dr Heath coming to visit me, and finding that I ventured so often out in the streets, earnestly persuaded me to lock myself up and my family, and not to suffer any of us to go out of doors; to keep all our windows fast, shutters and curtains close, and never to open them. (Defoe 1722)

> I have no idea how Eustis got sick. But when he abruptly flew back to New York and missed opening night on February 20th, I knew something was wrong. Texas was thought to be outside the danger zone that month, but retrospective modelling suggested that the virus likely had been infecting at least ten people a day since the middle of the month . . . By the end of February, there was probable local transmission in thirty-eight states. (Wright 2021, 37)

Three hundred years separate the first excerpt from the second. The first passage appears in Daniel Defoe's 1722 publication, *A Journal of the Plague Year: Being Observations or Memorials of the Most Remarkable Occurrences as well as Public as Private which happened in London during the Great Visitation of 1665*. The second excerpt is from a long-essay called *The Plague Year* by the non-fiction writer and journalist, Lawrence Wright, that appeared in a January 2021 issue of the *New Yorker* magazine. This latter is an episodic public history of the Covid pandemic since it struck the world in December 2019. Consisting of twenty-one journal entries, it is an exercise in factual reporting with personal case studies, a step-by-step account of the cascading disaster as it unfolded throughout 2020. Defoe's *Journal* is a verisimilitude of factual and eye-witness reporting, an imaginative foray that deceived readers at the time into thinking it was a work of non-fiction even though it was published in 1722, nearly fifty years after the bubonic plague struck London. The novel features extensive numerical tables of the sick and the dead, and a detailed exposition of extant medical research on pestilential contagion. Defoe's work appeared so authentic to the reading publics that popular journals at the time featured his novel alongside medical treatises by Richard Mead (Fellow of the Royal Society), Thomas Phayer (who wrote a treatise on plague in the sixteenth century), and Nathaniel Hodge (author of *Loimologia* on the 1665 plague and the primary source of Defoe's text). As Richard Mayer notes, "There is no reason to believe that Defoe's *Journal* was perceived any differently from the works by Bradley, Mead or Hodge" (Mayer 1990, 532). Things changed somewhat in the nineteenth century as distinctions between the factual and the fictional gained literary currency. Defoe's first major biographer, Walter Wilson, wrote in his *Memoir of the Life and Times of Daniel Defoe* (1830): "Defoe has contrived to mix up so much that is inauthentic with the fabrications of his own brain, that it is impossible to distinguish one from the other; and he has given the whole such a likeness to the dreadful original, as to confound the sceptic, and encircle him in his enchantments." John Richetti calls the *Journal* a "pseudohistory," "a thickly factual, even grossly truthful book" in which the "imagination flares up occasionally and dominates those facts" (qtd. in Mayer 1990, 541–542). The critic widely credited with the view that Defoe's work ought to be seen as a novel rather than a historical treatise on plague is Everett Zimmerman. In 1975 he wrote: "It is the intensity of the focus on the narrator that makes *A Journal of the Plague Year* . . . more like a novel . . . than history" (Zimmerman 1975, 124).

While the form, mode, and even the title of Wright's *New Yorker* essay is inspired by Defoe's paradigmatic fictional journal, it is Wright's novel *The End of October*, published barely a month before the onset of the Covid pandemic, that exemplifies almost every feature of what novel theorists call "formal realism" after Ian Watt's classic study: novels that offer a strong verisimilitude of a recognizably

plausible texture of life and within which run a double-text story – documentary evidence that "confirms or chronicles the guise of authenticity to the stories at hand" (Seidel 202). The protagonist in *The End of October* is an Anthony Fauci-like figure, Henry Parsons, an infectious diseases expert and viral immunologist who works at the CDC in Atlanta. He is alerted to a strange viral outbreak in an internment camp in Indonesia and is sent to investigate it. The pandemic's unfolding across the globe – from Indonesia to West Asia and the rest of the world – draws extensively from the experience of virologists and epidemiologists who tracked the outbreak of SARS, H1N1, H5N1, MERS, and Ebola. References to the 1918 Spanish flu and comparisons with the genetic structure of the coronavirus that caused it, factual details about the spread of SARS in 2004, and the abysmal state of pandemic preparedness in the United States, are uncanny. As is this description of the virus that causes the pandemic: "a spiky round ball, tinted in red and green, looking like a Christmas ornament" (108). A reviewer of the *New York Public Radio,* Scott Detrow notes: "Wright clearly did his homework researching this book, and given his reporting background, couldn't resist sharing every fact about pandemics, infectious diseases, public health planning, government disaster contingencies, and vaccines that he dug up" (Detrow 2020). The novel's acknowledgements page is a Who's Who of the epidemiological world. Luminaries include Dr. Philip R. Dormitzer, chief scientific officer of viral vaccines at Pfizer, and Dr. Barney Graham, a viral immunologist and the creator of Moderna's mRNA vaccine.

What makes *The End of October* exceptional is the same quality that marks Defoe's *Journal*: deep, thorough research with the author's reporting skills bringing alive a contemporary world of pestilence, war, and social collapse that cuts to the bone. There is one significant difference. The ground of verisimilitude – the notion of what constitutes real evidence both scientific and social – in each work is fundamentally different. Defoe's *Journal* emulates genres of factual reporting of his era and captures in graphic detail the bubonic plague that ravaged London in 1665. Wright's novel is about *what could plausibly happen*. The novel reads like a pandemic simulation exercise that generates a probabilistic scenario based on available scientific data, epidemiological variables, and the history of global public health. This is formal realism in a speculative mode, signalling a near future.

Ironical as it may seem, given that the United States has the highest Covid death numbers in the world, the country's biosecurity regime was unusually active between 2001 and 2019 in leading the world in preparations, mobilizations, and simulation exercises on pandemics. Some of these simulations include *Dark Winter* (2001), *Atlantic Storm* (2005), *Clade X* (2018), and *Crimson Contagion* (2019).

The most widely discussed simulation exercise is *Crimson Contagion*.[4] On March 19, 2020, *The New York Times* published a story entitled, "Before the Virus Outbreak: A Cascade of Warnings Went Unheeded." Here is the simulation scenario in *Crimson Contagion*:

> An outbreak of the respiratory virus began in China and was quickly spread around the world by air travellers, who ran high fevers. In the United States, it was first detected in Chicago, and 47 days later, the World Health Organisation declared a pandemic. By then it was too late: 110 million Americans were expected to become ill, leading to 7.7 million hospitalised and 586,000 dead. That scenario, code-named "Crimson Contagion" and imagining an influenza pandemic, was simulated by the Trump administration's Department of Health and Human Services in a series of exercises that ran from January to August 2019. 19 federal agencies, 12 states, 74 local health departments, and 87 hospitals participated in it. (Sanger et. al 2020)

According to the report available on the website of the Department of Health and Human Resources, officials at the National Security Council in the White House were briefed during the exercise. The simulation's sobering results drove home just how underfunded, underprepared and uncoordinated the federal government would be for a life-or-death battle with a virus for which no treatment existed. Mayor Lori Lightfoot from Chicago was blunt in a telephone briefing with reporters. "It is clear to me the federal government will not help us," she said. "They are not the cavalry." The recommendations offered in this simulation exercise went unheeded. The United States was after all ranked first in the 2019 Global Health Security Index among 195 countries with a score 83.5 in terms of its pandemic preparedness.

In Wright's novel, the coronavirus, Kongoli, is far more virulent than the Covid-19 or the influenza virus featured in *Crimson Contagion*. The outbreak of Kongoli reveals a mortality rate close to forty percent. It eventually plunges the world and the United States into a horror whose intensity exceeds what we have experienced so far – complete social breakdown, governmental collapse, and a raging world war conducted with bio- and cyberweapons. And yet the story is deeply plausible when we read of school closures, lack of ventilators, looting of ATMs, racial savagery, and mass death. Much like pandemic simulations, Wright says, "I am merely extending trends I see in the world to certain logical conclusions . . . I made some lucky guesses, but for the most part, what people are reading as prophecies is just what experts told me would happen." Expertise, briefing

4 Details of this simulation exercise appear in Department of Health and Human Services (HHS) Crimson Contagion 2019 Functional Exercise After-Action Report, 2020.

books, scenario exercises – "all of that stuff was on the table. It was there for anybody who was interested, and I was interested" (qtd. in Horton 2020).

Wright's novel registers a fundamental shift in the moral and aesthetic lexicon of catastrophe in our time. Even though the novel depicts a heroic protagonist – the virus hunter Henry Parsons who single-mindedly pursues the origins of the lethal Kongoli virus and cracks the mystery at great personal loss – the human is no longer perceived as a sovereign agent nor is the novel saturated with visions of progress and moral uplift. The anthropocentric fallacy is foregrounded repeatedly in the novel. In an episode on a submarine while trying to escape the deadly virus, Henry Parsons is shocked by a large clattering sound coming through the sonar and thinks they are in danger of being torpedoed by the Russians. The sound, he learns, is caused by a dangerous shrimp. The captain explains to Henry:

> We think humanity has the best weapons, but the snapping shrimp has a claw that closes so fast that it creates a shock wave that kills its prey. The noise you hear is the air bubble popping when the claw snaps. They create a microburst of heat that is about the temperature of the sun. (Wright 2020, 320)

Another passage from the novel that depicts a conversation among White House officials about the dangers of cyberwarfare and the nonhuman scale of infrastructural paralysis:

> Imagine the damage you could do if you controlled the valves and meters of utilities all over the country. The water plants, the nuclear facilities. Many of them were governed by those same Triconex systems, which were designed to keep Saudi utilities safe. They'd be blowing up transformers and generators, knocking off power for months or even years. Russian subs sniff around undersea cables. They could cut off the internet or compromise it to the point that it becomes unusable. Pretty much everything this country runs on could be brought to a halt. (122)

The exchange highlights the extent to which our techno-scientific and socially engineered systems have overtaken our ability to control them and their runaway impact on the earth system. We find ourselves in the realm of the nonhuman as we take the measure of our limits in controlling what we have created. Anthropocene, as this new geological phase of our earth system is provisionally called, is profoundly technospheric. The scientist merited with popularising the idea of the technosphere is the geologist and environmental engineer, Peter Haff. Here is how he conceives it:

> The technosphere includes the world's large-scale energy and resource extraction systems, power generation and transmission systems, communication, transportation, financial and other networks, governments and bureaucracies, cities, factories, farms and myriad other

> 'built' systems, as well as all the parts of these systems, including computers, windows, tractors, office memos and humans. . . . . The technosphere represents a new stage in the geologic evolution of the Earth. It is a global system whose operation underpins the Anthropocene and therefore merits special attention in our attempts to understand the role of humans in a nascent geologic epoch. (127)

A related concept, "Fallout," formulated by Joseph Masco, captures the nonhuman temporality of nuclear and toxic industrial accidents. Fallout is the long-drawn negative effect on earth dwellers of unexpected catastrophes such as nuclear accidents, oil spills, and industrial disasters. These foul up air, water, and soil to such an extent that their damaging effects last well beyond a human being's lifetime. "Fallout," writes Masco, "is an invention of the nuclear age, appearing in the English language soon after the US atomic bombing of Hiroshima and Nagasaki in 1945 . . . .[it] refers to the radioactive debris put into the atmosphere by a nuclear explosion . . . Fallout is thus an environmental flow that matters to health and safety, but that also demands a *new form of everyday perception and governance*" (Masco 2021, 20–22, emphases mine). The idea of a risk society proposed by Ulrich Beck (1992) is pertinent here. A risk society is a new iteration of the biopolitical, one dedicated to managing life by constantly modelling scenarios of future threat within a globally networked financial, bioinformatic, and natural systems. Such a society is governed by identifying mechanisms that may help large populations acquire immunity against probable catastrophes when systems are stretched to their very limit. The emphasis here is less on the intrinsic intensity of a threat than its potential to engulf the entirety of the globe. Such a technospheric planet is perceived as an uncontrolled science experiment; that is, there is no spare planet on which we can conduct a nuclear war; no second atmosphere which we can heat and observe the results. We live, in the words of the climate scientist, Will Steffen, in a "no-analogue world" (Steffen 2015, 94).

How, I ask, might we reimagine formal realism in the face of the impossibly vast finitudes that various scientific modelling exercises throw in our face? Coronaviruses are so small that 10 trillion of them weigh less than a raindrop. As of April 18 2022, 420.49 parts per million of carbon dioxide appear in our atmosphere. The last time the planet's air was so rich in carbon dioxide was millions of years ago before the Stone Age. The annual rate of increase in atmospheric carbon dioxide over the past 60 years is about 100 times faster than previous natural increases, such as those that occurred at the end of the last ice age 11,000–17,000 years ago. When Ian Watt wrote in his celebrated treatise of 1957, *The Rise of the Novel*, that the realist novel was the aesthetic equivalent of a more "dispassionate and scientific scrutiny of life than had ever been attempted before," he was not talking of time-scales associated with geological and evolutionary phenomena that are unassimilable to the relatively miniscule

scale of modern human history (Watt 1957, 2). Nor was he thinking about quantum, molecular, or nano scales. The alignment of science and literature that Watt envisioned was less about a deeper engagement with scientific breakthroughs than with a particular mode of apprehension of the world: dispassionate, objective, deliberate, and detailed. This investment in a factual and rational everyday matrix was not meant to accommodate implausible shifts in scale that threatened the collapse of a newly forged rational and demystified novelistic universe.

The speculative mode of realism adopted in Wright's *The End of October*, offers an impetus to argue that digital modelling and simulations constitute the ground of formal realism in the twenty-first century in the way that newspapers, bureaucratic reports, medical case histories, and print inventories of population and public health constituted the ground of formal realism in the eighteenth and nineteenth centuries. Further, the calculation of the extent of risk through various modelling exercises that have exponentially grown in our digital era, has scarcely any room for individual experience or for practical judgement. These models only tell us what will happen in general. The mysterious historicity of the singular life dissolves in risk modelling. In recent decades we have witnessed a global shift from standard statistical models to Bayesian models, to chaos theory in physics, and to catastrophe theory in mathematics. These theories, widely used in the non-human sciences dealing with mega phenomenon (geology, evolution, meteorology, astrophysics), now have to factor in the "human" as a planetary force. Applications of Bayesian theory have grown exponentially in many probability models where relevant statistics are difficult, if not impossible, to obtain. These are stochastic models aimed at capturing the spiralling effects of random variables. A stochastic model typically has a random probability distribution or pattern that can be analysed statistically but not predicted precisely. In the context of both the Covid pandemic and climate change, we daily witness the tremendous authority accorded to such stochastic models. The realm of everyday experience becomes indistinguishable from its representation in newsrooms, laboratories, digital models, proxy data, and simulation exercises.

The ground of the "real" shifts in risk modelling as it does in theories of formal realism. Data sets and simulations become our documentary evidence and realist forms. The speculative novel and the simulation exercise can be both perceived as working at an intermediate level of abstraction between phenomena, the phenomenological, and mathematical forms of representation.[5] There is an emerging scholarship on models and simulation as animated social theory and as a mode of world-making (Edwards 2010, Opitz 2017). Scientific models, notes Joseph Rouse,

5 See Nersessian (2005).

are "transformations of the world . . . [they]transform the available possibilities for acting . . . by materially enabling some activities and obstructing others, and also by changing the situation that some possible actions or roles lose their point, while others acquire new significance" (Rouse 1999, 449–450). In the context of my discussion of formal realism in Wright's novel, it behooves noting that simulations are seen to provide not a mimetic representation of the real world but a doubling of reality, or what Niklas Luhman calls "*Realitatsverdopplung*" (Luhman 1982, 131). They add worlds to the world. They function not only as "a means of prediction but also as a technology of premediation, producing a series of present and plausible futures in order to map the space of contingency" (Opitz 2017, 409). We also see a dramatic transformation in ontologies of the *real* in simulation exercises. The *real* is not empirical where every data set derives from sensory experience. Nor is it mimetic in the sense of providing an adequation or verisimilitude of an outer stable reality. It is not simulacral either in Baudrillard's sense, where the very ground of the real has disappeared. What we witness is a fundamental *doubling* of the real, a hypothetical real of a magnitude (often catastrophic) that could be a logical outcome of the contingent realities of the present.

Simulations and, concomitantly, novels like *The End of October*, generate not a phantasmagoric scenario of apocalypse, but a mode of realistic apprehension that purports to take uncertainty, indeterminacy, complexity, and vast finitudes into account. Instead of inviting us to contemplate end times in an apocalyptic mode, we are urged to recognize that these vast finitudes, these sublime indices are all around us. "Think of the sheer numbers with which global warming is thrust on us," writes Tim Morton, "like something from a book of records, global warming is spectated as the biggest, the most, the hugest." "Earth and actually existing beings," continues Morton, "that live here are bathed in a giant sea of numbers . . . I need no special props, no *deus ex machina*. I don't need the apocalypse . . . the trivially mathematized fact of hyperobjects' longevity is all the help I need." (Morton 2013, 137).

In novel studies today, the ground of formal realism is no longer mimesis, if by this we mean the reassuring intermediate world of embodied experience, human-scale reality to which our perceptual, cognitive, and affective apparatus is attuned. We move into the realm what Peter Boxall calls the "prosthetic" imagination, and what I call the "speculative" or the "virtual" where the novelistic world, much like the world of big data, acquires an artificial life that shapes our phenomenological apprehension of the world (Boxall 2020). This artificiality or virtuality is not a deficit of reality but its doubling in a highly formalised speculative mode where we can see nested scales of the real from the everyday to the vast nonhuman futures. Rendering risk invisible and tolerable to the general public through purported management by scientific, technological, and political

expertise, I argue, has only intensified our everyday consciousness of the unimaginable and inexperienceable. The epistemic stakes of the *real* in anticipating catastrophes in novels such as Wright's *The End of October* is that they seriously address and give flesh to the incalculable and the inexperienceable that lie at the heart of realist epistemologies underpinning modelling and simulation exercises. As Wendy Chun says, "if we are convinced of their verisimilitude, we may act in such a way that their predicted results can never be corroborated by experience" (Chun 2015, 678).

In this era of increasing indeterminacy, we enter a realm of speculative experience marked by what Derrida calls the *undecidable*, the experience of that which, though "foreign and heterogenous to the order of the calculable and the rule" must nevertheless deliver over to a range of "impossible decisions" (Derrida 2002, 252). Here is deconstruction morphing into a planetary ethic – an attunement to a catastrophic mode that can no longer derive consolation from the secular theology of end-time narratives. We are urged instead to act within an immanent realm of vast nonhuman pasts and futures. This is what novels like *The End of October* bring to the fore when epidemiologists discover the origins of the virus Kongoli in an extinct woolly mammoth discovered by paleobiologists in Siberia that is then reengineered in a lab for use in biological warfare. Such literary works also challenge the trope of mastery one often finds in the scientific modelling exercises. Risk calculation is a Promethean enterprise, one that holds on to the illusion that we are masters of the earth. An exchange between Henry Parsons and his renegade colleague, Jurgen Stark, in *The End of October* is apposite here: "Jurgen gave him a quizzical look. 'I make no apology for our work here. Playing at God is the only choice we have if we want to save the earth. Consider what humanity has done to the planet.'" (Wright 2020, 368) Jurgen refers to a secret bioweapons project that he and Henry Parsons were both involved in before the latter abjured it on ethical grounds and moved to the kind of epidemiological research that he hoped would benefit humankind rather than destroy it. Jurgen, in contrast, is a radical misanthrope and an environmental fascist. He loves the planet so much that he would rather destroy all humans with nature's weapons (i.e. viruses) than have them destroy the earth system.

Wright's novel reminds us that although we humans think we are dominant within our ecological niche, many other niches exist that overlap with our own, and they operate by entirely different rules over which we have less and less control. Henry Parsons muses at one point:

> It was pointless to ascribe consciousness or intentionality to a disease. It was not remorseless or cunning. It simply was. Its purpose was to be. But he also knew that viruses

> were constantly reinventing themselves, and there would never be a freezer large enough to contain the manifold weapons nature employs to attack its own creatures (354–55).

In our risk societies where catastrophes are ever on the horizon, science becomes more and more necessary, but less and less sufficient to account for the inexperienceable that lies at the heart of vast nonhuman finitudes of our technoplanetary era.

2 Planetary Realism: Geology, Hydrology, and the Techno-Human

I now turn briefly to an explication of what I call planetary realism by exploring a facet of nineteenth century literary history that links the rise of geology to the realist novel. In 1833, Charles Darwin's mentor, Charles Lyell, author of *Principles of Geology*, mooted the idea of a new interglacial interval of the Quaternary period that was relatively stable, and highly habitable, and that began about 11,700 years ago. He used the terms "Recent" for this new geological epoch in which, as he put it, "the earth has been tenanted by man."[6] In 1867, a French palaeontologist, Paul Gervais named Lyell's idea the "Holocene." These marked three key developments: the victory of gradualist views in the sciences, a denunciation of catastrophism as unmodern, and an affirmation of the figure of the man of science as one who writes in the style of the "ethically and socially humble recorder of reality" (Buckland 2013, 16).[7] Charles Lyell's rise to the pinnacle of scholarly achievement in geology in nineteenth century Britain is marked by a distinctive turn away from cosmological and speculative approaches to thinking earth history, and to geology as an empirical science marked by a meticulous accumulation of factual data from fossils and rock layers. Key to this shift were extensive debates about the appropriate narrative form in which to present this *factual* history of the earth. Earth's form was only beginning to be scientifically excavated. What narrative form would be equal to this task?

Not only does Lyell go on to write in a deliberately factual and realist mode, he also advocates a theory of gradualism for geological history under the term, "uniformitarianism." This concept valorizes patterns of incremental change over a vast span of time and pays attention to minute causal chains. It also makes the

6 See an account of the Holocene in Roberts (1998).

7 The words are attributed to Sir Thomas Sprat, the founder of the Royal Society. Cited in Buckland (2013, 16).

"human" the measure of all past geological transformation; not the human as a disruptive geological agent conceived by the term Anthropocene, but the species that thrives at the scale of the ordinary and the everyday due to the interglacial habitability and stability of the Holocene. Darwin's idea of the evolution of species as a slow and gradual event spanning millennia and even millions of years, owes its origins to Lyell's theory of gradualism. This scientific consensus on gradualism emerged in tandem with the consolidation of the status of the realist novel, and of realism itself, as the epitome of literary fiction – a formal development that broke definitively with the generic conventions of the catastrophic and the unnatural that shaped other literary modes, such as fantasy, gothic and science fiction.

By the year 2000, the pervasive gradualism of Lyell and Darwin falls away and a new catastrophism emerges that, in the words of Jeremy Davis, inaugurates "a new geology . . . that lets into the picture abrupt die offs and bursts of species formation" (Davis 2016, 9). A decided rhetoric of catastrophism marks Paul Crutzen's and Eugene Stoermer's celebrated inauguration of the idea of the Anthropocene at the turn of the century:

> The expansion of mankind, both in numbers and per capita exploitation of the earth's resources has been astounding . . . more than half of all accessible fresh water has been used by mankind; human activity has increased the species extinction rate by thousand to ten thousand fold in the tropical rain forests . . . .mankind will remain a major geological force for many millennia, may be millions of years to come. (Crutzen and Stoermer 2000, 17–18)

This is a catastrophic vision of humankind's impact on the planet that is couched not in a speculative or fantastical mode, but in a realist one. The challenge of thinking realism in the Anthropocene, I contend, is to confront the limits of a paced-out, gradualist, and granular discourse of interiority and social change, and to re-cast its "antinomies" – speculation, scalar experimentation, improbable occurrence, hypernaturalism – as belonging in its sphere. The critical gesture called for is not so much an overthrow of the distinction between realist fiction and science fiction, but a careful tracing of mutations in the former as it discovers its new generic provenance without losing its two foundational attributes: one, the ability to capture a "sense of the ontology of the present as a swiftly running stream;" two, an orientation toward a collective social destiny. A synthesis of both has been its hallmark, as Fredric Jameson reminds us (Jameson 2015, 146).[8] The novel's collective social destiny now spans

8 See also, Jed Esty's comment from a related perspective in his essay "Realism Wars": "If new realist novels find ways to represent 'combined and uneven development' in the global

the planet. Its temporal frame extends far beyond an individual's or a society's lifetime.

The contemporary global novel of the realist variety, I have suggested in a recent essay, can begin to be conceived as a mutant form that not only has its pulse on our catastrophic present but also one that encodes futurity in the present as it registers the shock of unpredictable biosocial and geological transformations on a planetary scale. I urge us to pay attention to these mutations in realist novels that encode, not an imaginary future of humankind (the realm of sci-fi) but non-human planetary futures that are already being written into the earth's stratigraphy by our radioactive and carbon-intensive lifeworlds.[9] I'd like to add another idea derived from the earth sciences here: the concept of *drift* as a planetary phenomenon in the way things move "within the extended body of the earth"; biological and genetic drift that generates unexpected patterns across species; and drift as aimless wandering across time and space as against locomotion that is deliberate, focused, and goal-oriented (Szersynski 2018, 136).[10] The idea of drift as a planetary force is particularly resonant when one turns to fiction around large water bodies, especially oceanic and hydrological histories that have had such dramatic terraforming impacts.

That oceanic histories of the capitalist world system are intertwined with the history of climate change is now global commonsense. Hundreds of years of fossil fuel use that powered the modern world have come back to haunt us in the form of warming oceans, coral bleaching, plastic contamination of marine life, inundated islands, hurricanes, tsunamis and floods. The scholarship on oceanic literatures and planetary humanities ranges across postcolonial and submarine histories of the Caribbean hit by frequent hurricanes, narratives about nuclear waste dumping and disappearing islands in the Pacific Ocean, climate fiction on the impact of sea level rise on coastal landmasses around the Atlantic, the Pacific and Indian Oceans, climate change and security narratives in the South China Sea, refugee life-writing on Mediterranean crossings by the climate displaced, histories of deep-sea extractivism, reef ecologies, interspecies aesthetic forms, and literary/artistic capture of environmental collapse in the polar regions.

The planetary turn in oceanic studies envisions a nonhuman temporal arc going back to our evolutionary past and into a geological future hurtling toward a catastrophic warming of the planet and the sixth largest extinction of species

---

frame where it cannot be mediated into the destiny of a single people, this may well explain the rising force of apocalyptic and Anthropocene models as ways to identify collective problems operating at planetary scale" (2016, 336).

9 See Ganguly (2020).

10 See also Nuttall (2021).

the earth has ever witnessed – an attempt to place pre-modern and modern histories of oceanic crossing within assemblages of natural phenomena such as regional climate terrains, monsoonal zones, tidal ebb and flow, flooding rivers, hurricanes, tsunamis and snow storms. These natural forces are foregrounded as active agents in the making of human history. Planetary oceanic studies engage with what Elizabeth Deloughrey calls "sea ontologies," an immersive way of being in the *more-than-human* temporality of the ocean, as also a conception of "maritime space as a multispecies and embodied place in which the oceanic contours of the planet, including its submarine creatures, are no longer outside the history of the human" (Deloughrey 2017, 36, 42).

An immersive, multispecies aesthetic world, that of the Indian Ocean, and more specifically the region around the Bay of Bengal, features in Amitav Ghosh's novel, *The Hungry Tide* (2004) and his latest work, *Gun Island* (2019). Both novels blend natural, historical, and planetary time in their narratives, and are formally shaped by the ferocity of tides and oceanic drift, not to mention the entanglement of human and nonhuman species. Ghosh's *The Hungry Tide* appeared at a time when the idea of catastrophe was associated with geopolitical upheavals like 9/11 and the global war on terror. The term "climate change" had just about begun to emerge into public consciousness. Before the emergence of "climate change" as an overarching frame, concerns about population growth, industrial pollution, nuclear contamination, endangered species, and resource shortage dominated perceptions of ecological crisis. Climate change brought the phenomenon of global warming into focus as also catastrophic scenarios of sea-level rise and inundation of large coastal zones. Ghosh's novel prefigures this shift and works formally at the cusp of this transition in global environmental consciousness. The novel is a powerful depiction of the role of non-human actors such as tides, rivers, bays, tigers and dolphins in shaping the precarious lives of a community of refugees, social activists and fisher folk in the mangroves of Sundarbans in the Bay of Bengal at the eastern most edge of India. Sundarban's uncanny ecoscape functions as a metonym of our planet's alterity to the human scheme of things. An aspect of the novel's planetary aesthetic is its displacement of human exceptionalism and its breathtaking scientifically-informed depiction of multispecies relationality through the figure of the endangered Irrawady dolphin, the cetologist, Pia Roy, the fisherman, Fokir, and the tides in which they explore, swim in or even fatally encounter a world teeming with cetaceans, crabs, shrimps and other aquatic creatures.[11]

11 For a detailed analysis of Ghosh's novels see Ganguly (2020).

Ghosh's latest novel *Gun Island* takes up the challenge he offered to literary novelists in his non-fiction tract, *The Great Derangement*: *Climate Change and the Unthinkable* (2016), that they seriously rethink their conventional realist modes and engage with the uncanny force of the non-human and the larger planetary world in their creative work. Scalar experimentation in Ghosh's latest novel is quite breathtaking. The mystery of the gun island unfolds in an extraordinary tale of climate upheaval and mass migration stretching from the perturbations of the "Little Ice Age" in the seventeenth century to our contemporary crisis of climate displacement. The current refugee and migration problem – attributed to climate change – that has led to the rise of the far right and neo-fascist groups across the Americas, Europe, and the Anglo-Pacific world, resonates throughout the novel. The novel–part thriller, part folklore, and part treatise on climate change–revolves around the mystery of a folk figure, *bonduki sadagar* (literally, gun merchant) featuring in a pre-modern Bengali text, and the protagonist, Deenu's quest for the origin myth that begins in the Sundarbans – the deltaic region in the Bay of Bengal that Ghosh portrayed with such power in *The Hungry Tide*. What follows is a layered story of climate upheavals, natural disasters, unpredictable encounters, and philological discoveries across an oceanic realm stretching from the Indian Ocean to the Mediterranean over four hundred years. Venice is revealed as the source of the term "bonduki" for its long history of gun and warships manufacture, hence *Gun Island*. Ghosh plays adroitly with early modern mythographies of sea power that converged in and around Venice. Venice's Arsenale was the largest industrial complex in the world before the Industrial Revolution. Ghosh situates Venice at the heart of his cataclysmic oceanic adventure tale, thus reviving its mediaeval and early modern glory as an imperial naval power whose reach extended to the waters across South and South East Asia. The novel traces a marvellous geography of encounters across this Indo-Mediterranean terraqueous zone. It offers an oceanic aesthetic at a scale that not only exceeds post-Mercator realist cartography, but also breaks apart the latter's carefully calibrated continental boundaries. One is reminded here of a short story by the Tanzanian novelist Abdulrazak Gurnah, "Mid Morning Moon," that features a fifteenth century *mappa mundi* created by a Venetian cartographer-artist, Fra Mauro. A copy of this map hangs in the apartment of a tutor in Zanzibar who teaches the protagonist East African history. The map features the Indian Ocean world in all its cultural, material, and environmental complexity before the rise of the Europeans. The East African littoral and the Cape, in particular, feature at the centre of a *dhow* trading culture that eventually morphed into a capitalist world system with the flow of Iberian trading ships. Scalar variations figure in stunning ways in Gurnah's work as it does in Ghosh's novel. The Venetian map creates a world that was all but lost a century later. The Mercator projection enlarged the Euro-Atlantic

region and rendered Indo-Mediterranean littoral societies peripheral and invisible. Significantly, the *mappa mundi* in Gurnah's story invokes a shipwreck in which the tutor's ancestors perished. An inscription on Mauro's map indicates that this shipwreck was the source of his knowledge of the Cape. Filial history and cartographic aesthetics merge in this story as does the nonhuman oceanic world, for, "the *mappa mundi* renders the ocean thick with human and nonhuman activity: waves and currents are inscribed, whales and fish sport between dhows and junks and are interspersed with banners containing the narratives Mauro collected from travellers in Venice" (Samuelson 2017, 23). Gurnah and Ghosh illuminate an oceanic aesthetic that encompasses planetary space-time, natural logic, and human-nonhuman entanglement.

In the final pages of this chapter, I turn to a Zambian novel that experiments with the realist mode in a hydrological register that animates what I have been calling the speculative realm of the techno-planetary. Namwali Serpell's *The Old Drift* is a spectacular mash up of myriad genres – the postcolonial novel, magical realism, speculative fiction, and Afrofuturism. The work is epic in scope, spanning Zambian lives across four generations from the early twentieth century to the mid-twenty-first. The title is derived from a drift on the Zambezi river five miles above the Victoria Falls, the port of entry into North-western Rhodesia, and the place where the Zambezi river is at its deepest and narrowest, the best spot for "drifting a body across". It was from here that earlier white settlers ran a transport service across the river. By 1958, settlers and colonial officers are displacing local people, harnessing African labour and building a huge dam, to be named Kariba, on the site of the Old Drift. The river is flooding earlier than usual in the season, and the huge hydrocolonial construction project is conceived in a non-heroic language as "crawling with men, fly-like amongst the beetling machines. It looked like a mammoth corpse, half-dissected or half rotten." As the river waters seeps through a fault line and floods the dam cavity from the inside, "a swirling thrusting deluge, red as blood because of the copper in the dust here, a crane they hadn't managed to move swivelling wildly in the gushing torrents" barrels through the flood plains (Serpell 2019, 70). Parts of the novel are narrated by a non-human collective intelligence, a mosquito swarm that emerges as an afrofuturistic take on the Greek chorus, "*thin troubadors, the bare ruinous choir, a chorus of gossipy mites*." A mosquito swarm takes up the story of the hydrological disaster that is the Kariba Dam: "The feckless *bazungu* continued building the dam. When the flood came again, it lifted four men, plastered them to the dam like insects. The concrete was wet; the workers were dead; in the end, they built the dam around them. Strange tomb!" (78).

In a dazzling scalar interplay, the song of the swarm forms a "*weird and coordinate harmony*" of nonhuman times both ancient and futuristic – at once an

insect world from time immemorial and a cyborgian consciousness that has *"woven a wordly wily web . . . spindle bodies strung in a net of spacetime"* (19). The swarm buzzes, glides, and sways through the pages as it feeds us stories of its planetary intimacies that precede human existence by millions of years. These intimacies eventually enfold the human and appear far from pestilential, at least from the swarm's point of view:

> *We have a hundred eyes, we smell your scent plume, we sense your heat as we near you. You might hear us sing as we wing through the dark, alighting on knuckles and ankles, but our feet are so tiny, we land without notice, the gentlest of natural surgeons. We use the thinnest, most delicate needles . . . counted in grams, the boon is a droplet, but it weighs up to three times our mass . . . ducking the swat of a hand or a tail, we aim for a vertical surface . . . we've done our deft haematology, dripping away the watery broth and storing the solids for later. These we feed to our babies in need and this you become our wet nurses.* (318, italics original)

The swarm's choric voice laments the folly of humans in treating mosquitoes only as disease vectors. Viruses carried by mosquito swarms are part of our evolutionary history, it tells us. "*And what do we leave you in kind of recompense? A salivary trace, a gum to stop your blood clotting. It's harmless but foreign, and your body is foolish, so it attacks itself in dismay . . . it sparks a histamine frenzy"* (318). Human exceptionalism is flipped on its head as it were and we catch a glimpse of a world defined by symbiogenesis – a process of speciation more fundamental than genetic mutation, one that reconstellates the individual body as a hive of evolutionary traces from the simplest molecule to the most complex. A symbiogenetic paradigm of life is an ultimate affront to human individuality and its unique sociality.

In an audacious technoanimist narrative move, the mosquito swarm becomes the inspiration for a technological and medical marvel. Joseph, an epidemiologist and scientist, discovers a vaccine for a viral affliction that remains unnamed in the novel. Those infected are referred to as having caught "The Virus." The spectre of AIDS haunts the novel. Jacob, a tech wizard, designs drones inspired by the size and anatomy of the mosquito and sells them to the government. The purpose is not war. Jacob's automated swarm – named Moskeetoze – becomes the medium of mass vaccination of a population ravaged by the epidemic. Unlike drone acoustics in war zones that portend incineration with its whirring sound above, the cyborgian mosquito swarm evokes awe as it elegantly choreographs its descent, not to kill but to heal.

> Then a new sound. At first Naila thought it was the congregants again, humming their way through the crowd. But this was closer to a ringing, the electric sound of pylons growing steadily unbearable. It looked like smoke was pouring through the air, cutting in

> and out of the cone of light. People shouted and the mother next to Naila pointed. Her boy nodded. *Mulilo*, he said. Fire.
>
> But there was no burning smell, no searing heat, no flame. The smoke's syrupy sweep through the cone of light reminded Naila of a starling murmuration. It swung around, its ringing sound drawing near, then far, flooding thick, spiralling wide. Its outer edge swept past her and she saw tiny buzzing bits within it. Not smoke, microdrones.
>
> Naila felt the cumulative touch of them on her face and neck – a whispering feeling, as if a furry wind were passing by. Then she felt the gentle needling. A dozen twinges, a hundred, a thousand, each no more painful than a normal mosquito bite. The swarm – they were Jacob's Moskeetoze, she was sure of it, the one's he had sold to the government – had landed upon the crowd and begun to puncture them. (542–43)

Having accomplished its mission, the drone swarm ascends in "measured spirals" and "skitter [ed] up in the cone of light." (544). The vaccinated people look for the usual signs of a mosquito bite and find painless welts that don't itch. They have apparently been rendered immune by the collective sting of the Moskeetoze.

The Moskeetoze perform yet another feat in the novel, that of eco-political sabotage. The drone swarm is mobilised in a political cause by a group of activists protesting the ecological ravages of the Kariba dam. The leaders, Naila, Joseph, and Jacob, place solar-powered transmitters in the dam's sluices and program the Moskeetoze to find the transmitters: "Within minutes the sluice's inner surface would be lined with their tiny bodies. Sluices often got jammed this way with detritus like leaves and sticks that the workers had to clean out, so the infiltration had to be subtle" (555). Thousands of drones are released by this group through the night to cause a slight malfunction. Unexpectedly for its human creators, the swarm's mechanic logic takes over as it blocks the sluices completely. This unleashes a catastrophic flood that swallows the dam and all the inhabitants nearby, including Naila. The Zambezi begins flooding and the ecological landscape changes irrevocably: "Lake Kariba would soon become a river. The Dam would become a waterfall. And miles away, the Lusaka plateau, the flat top of Manda Hill, would become an island" (559).

Swept away by the flood are all pretensions of a human-centred world: its little vanities, its delusions of grandeur, its quest for intimacy, its sense of political urgency, its moral righteousness, and its overweening need to control the nonhuman sphere. The novel ends with the swarm chorus, but is the voice that of mosquitoes or of the Moskeetoze? We enter a techno-animist realm where insects and drones are indistinguishable actants:

> *Are we red-blooded beasts or metallic machines . . . are we truly man's enemy, Anopheles gambiae, or the microdrones Jacob designed? If that's who we are, then this tale has explained our invention. The problem is we'll still never know because . . . we have joined up*

> *with the local mosquitoes. We get along fine, but can't tell us apart in this loose net of nodes in the air. We just buzz about and follow commands and live lives of tense coordination. Half insects, half drones; perhaps all drones or none; maybe something will emerge, but what a joke! What an error! What a lark indeed! A semi-cyborgian nation!* (562, italics original)

The swarm's volatility exceeds all efforts at meaning-making. Human finitude is stripped of its existential carapace and folded into the swarm's techno-planetary churn: "*And so roil in the oldest of drifts – a slow, slant spin at the pit of the void, the darkest heart of them all*" (563, italics original).

My essay has traced radical shifts in the scale of realist aesthetics in our techno- planetary era by analysing anglophone novels across America, Asia, and Africa. Drawing on one one extant realist mode – formal realism – and an emerging one – planetary realism – I have traced the kind of aesthetic labour that is required of contemporary novelists to keep multiple scales in play. Temporally, these range in a non-linear fashion from the everyday to deep time. Ontologically, they render the human plural and in a continuum with nonhuman entities such as viruses, oceans, drones, animals, and birds. Unlike digital apps such as Google Earth or Google Maps that enable us to zoom in and out of multi-scalar spatial configurations at the slide of a finger, scalability in realist works, as this essay has demonstrated, is neither smooth nor frictionless. It can shape shift like the swarm and the miniscule can shatter the gigantic, much like the Kongoli virus.

Works Cited

Baucom, Ian. *History 4 Degree Celsius: Search for a Method in the Age of the Anthropocene*. Durham: Duke University Press, 2020.

Beck, Ulrich. *Risk Society: Towards a New Modernity*. London: Sage Publications, 1992.

Boxall, Peter. *The Prosthetic Imagination: The History of the Novel as Artificial Life*. Cambridge: Cambridge University Press, 2020.

Buckland, Adelen. *Novel Science: Fiction and the Invention of Nineteenth-Century Geology*. Chicago: University of Chicago Press, 2013.

Caracciolo, Marco. *Narrating the Mesh: Form and Story in the Anthropocene*. Charlottesville: University of Virginia Press, 2021.

Chakrabarty, Dipesh. "Climate and Capital: On Conjoined Histories." *Critical Inquiry* 41.1 (2014): 1–23.

Chun, Wendy. "On Hypo-Real Models or Global Climate Change: A Challenge for the Humanities." *Critical Inquiry* 41.1 (2015): 675–703.

Crutzen, Paul J., and Eugene F. Stoermer. "The 'Anthropocene.'" *IGBP Newsletter* 41 (2000): 17–18.

Davis, Jeremey. *The Birth of the Anthropocene*. Berkeley: University of California Press, 2016.
Defoe, Daniel. *A Journal of the Plague Year: Being Observations or Memorials of the Most Remarkable Occurences as well as Publick as Private which happened in London during the Great Visitation of 1665*. Project Gutenburg, https://www.gutenberg.org/files/376/376-h/376-h.htm.
DeLoughrey, Elizabeth. "Submarine Futures of the Anthropocene." *Comparative Literature* 69.1 (2017): 32–44.
Department of Health and Human Services (HHS) Crimson Contagion 2019 Functional Exercise After-Action Report, 2020. https://www.governmentattic.org/38docs/HHSaarCrimsonContAAR_2020.pdf (12 January 2022).
Derrida, Jacques. "Force of Law: The 'Mystical Foundation of Authority." *Acts of Religion*. Ed. Gil Anidjar. Trans. Mary Quaintance. New York: Routledge, (2002): 230–298.
Detrow, Scott. "Everything You Ever Wanted To Know About Pandemics In 'The End Of October.'" *NPR*, May 2020, https://www.npr.org/2020/05/06/850705321/everything-you-ever-wanted-to-know-about-pandemics-in-the-end-of-october.
Ganguly, Debjani. *This Thing Called the World: The Contemporary Novel as Global Form*. Durham: Duke University Press, 2016.
Ganguly, Debjani. "Catastrophic Form and Planetary Realism." *New Literary History* 51.2 (2020): 419–454.
Ghosh, Amitav. *The Great Derangement: Climate Change and the Unthinkable*. Chicago: University of Chicago Press, 2016.
Edwards, Paul N. *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming*. Cambridge: MIT Press, 2010.
Esty, Jed. "Realism Wars." *Novel: A Forum on Fiction* 49.2 (2016): 317–342.
Haff, Peter. "Humans and Technology in the Anthropocene: Six Rules." *The Anthropocene Review* 1.2 (2014): 126–136.
Heise, Ursula. *Imagining Extinction: The Cultural Meaning of Endangered Species*. Chicago: University of Chicago Press, 2016.
Horton, Adrian. "It's Unnerving: Lawrence Wright on the Eerie Prescience of his Pandemic Novel." *The Guardian*, 6 May 2020. https://www.theguardian.com/books/2020/may/06/lawrence-wright-end-of-october-interview-pandemic-novel.
Jameson, Fredric. *Antinomies of Realism*. London: Verso, 2015.
Lukacs, Georg. *Studies in European Realism*, London: Hillway, 1950.
Luhman, Niklas. "The World Society as a Social System." *International Journal of General Systems*, 8.3 (1982): 131–38.
Masco, Joseph. *The Future of Fallout, and Other Episodes in Radioactive World-Making*. Durham: Duke University Press, 2021.
Mayer, Richard. "The Reception of *A Journal of the Plague Year* and the Nexus of Fiction and History in the Novel." *English Literary History* 57 (1990): 529–556.
McGurl, Mark. "Gigantic Realism: The Rise of the Novel and the Comedy of Scale." *Critical Inquiry* 43.2 (Winter 2017): 403–430.
Morton, Timothy. *Hyperobjects: Philosophy and Ecology After the End of the World*. Minneapolis: Minnesota University Press, 2013.
Nersessian, Nancy. "Model-Based Reasoning in Distributed Cognitive Systems." *Philosophy of Science* 73.5 (2006): 699–709.
Nixon, Rob. *Slow Violence and the Environmentalism of the Poor*. Cambridge: Harvard Univeristy Press, 2011.

Nuttall, Sarah. "On Pluviality: Reading for Rain in Namwali Serpell's *The Old Drift*." *Interventions* 2021: (1–17). Doi: https://doi-org.proxy01.its.virginia.edu/10.1080/1369801X.2021.2015705.
Opitz, Sven. "Simulating the World: The Digital Enactment of Pandemics." *European Journal of Social Theory* 20.3 (2017): 392–416.
Roberts, Neil. *Holocene: An Environmental History*. Oxford: Blackwell Publishers, 1998.
Rouse, Joseph. "Understanding Scientific Practices: Cultural Studies of Science as a Philosophical Program." *Science Studies Reader*. Ed. Mario Biagioli. London: Routledge, (1999): 442–456.
Samuelson, Meg. "Coastal Form: Amphibian Positions, Wider Worlds, and Planetary Horizons on the African Indian Ocean Littoral." *Comparative Literature* 69.1 (2017): 16–24.
Sanger, David. E. et al. "Before Virus Outbreak, a Cascade of Warnings Went Unheeded." *New York Times*, 19 March 2020, https://www.nytimes.com/2020/03/19/us/politics/trump-coronavirus-outbreak.html.
Seidel, Michael. "The Man who came to Dinner: Ian Watt and the Theory of Formal Realism." *Eighteenth-Century Studies* 12.2–3 (2000): 193–212.
Serpell, Namwali. *The Old Drift*. London: Hogarth Press, 2019.
Steffen, Will, et.al. "The Trajectory of the Anthropocene: The Great Acceleration." *The Anthropocene Review* 2.1 (2015): 81–98.
Szersynski, Bronislaw. "Drift as a Planetary Phenomenon." *Performance Research: A Journal of the Performing Arts* 23.7 (2018): 136–144.
Thacker, Eugene. *In the Dust of This Planet*. Vol. I. Hampshire: Zero Books, 2011.
Thompson, D'Arcy Wentworth. *On Growth and Form*. New York: Dover Publications, 1992.
Watt, Ian. *The Rise of the Novel*. Berkeley: University of California Press, 2001[1957].
Woods, Derek. "Scale Critique for the Anthropocene." *Minnesota Review* 83 (2014): 133–142.
Wright, Lawrence. *The End of October*. New York: Knopf, 2020.
Wright, Lawrence. "The Plague Year." *New Yorker*, 4 and 11 January 2021. https://www.newyorker.com/magazine/2021/01/04/the-plague-year.
Zimmerman, Everett. *Defoe and the Novel*. Berkeley: University of California Press, 1975.