

A Short Pre-History of Climate Fiction

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The paper argues that contemporary climate fiction is a subgenre of sf rather than a distinct and separate genre for two main reasons: first, because its texts and practitioners relate primarily to the sf “selective tradition”; and, second, because its texts and practitioners articulate a “structure of feeling” that accords centrality to science and technology, in this case normally climate science. Not only is “cli-fi” best understood as sf, it also has a much longer history than is commonly allowed, one that arguably stretches back to antiquity. The paper distinguishes between texts in which extreme climate change is represented as *anthropogenic* and those where it is represented as *theogenic*, *geogenic*, or *xenogenic*; it also provides a brief sketch of the (pre-)history of stories of anthropogenic, xenogenic, and geogenic extreme climate change.

Climate fiction has increasingly become a matter for public commentary in both scholarly and popular circles. In the media, the Taiwan-based blogger and activist Daniel Bloom has proven an indefatigable propagandist on behalf of “cli-fi,” a term he coined in 2007 (Merchant). In academia, Amitav Ghosh’s 2015 Berlin Family Lectures at the University of Chicago mounted a very strong case for the necessity of climate fiction and an equally strong indictment of “literary fiction” for its failure to rise to this challenge. Ghosh argues that “ours was a time when most forms of [...] literature were drawn into the modes of concealment” that “prevented people from recognizing the realities” of climate change (11). This was so, he concludes, because “serious prose fiction” has been overwhelmingly committed to versions of literary realism that depend for their efficacy on notions of everyday probability. Extreme climate change, by contrast, necessarily involves everyday improbabilities: radically extreme weather events on the one hand, and a nonhuman Nature that is both sentient and proactive on the other. The irony of the realist novel, he writes, is that “the very gestures with which it conjures up reality are actually a concealment of the real” (23). Radical improbabilities have therefore normally been banished from literary fiction, he argues, into the “generic outhouses” of fantasy, horror, and sf (24). Alongside these more academic debates, Bloom, Brian Merchant, and others have prosecuted a case in mass media, including printed journalism, for cli-fi to be considered an important new genre in its own right, neither sf nor conventionally “literary” fiction.

Sf, Cli-fi, and the Theory of Genre

We have no objection to Ghosh's general case for the importance of climate fiction. Nor can we disagree with his criticism of the "strange conceit that science fiction deals with material that is somehow contaminated," nor yet with his conclusion that "many who once bestrode the literary world like colossi are entirely forgotten while writers like Arthur C. Clarke, Raymond [sic] Bradbury, and Philip K. Dick are near the top of the list" of twentieth-century novelists (72). But Ghosh's argument nonetheless remains complicit with the binary opposition between "literary" and "genre" fiction it threatens to undermine. So, when he tries to come up with the names of "writers whose imaginative work has communicated a [...] sense of the accelerating changes in our environment," Ghosh concludes that "of literary novelists writing in English only a handful of names come to mind: J. G. Ballard, Margaret Atwood, Kurt Vonnegut Jr., Barbara Kingsolver, Doris Lessing, Cormac McCarthy, Ian McEwan and T. Coraghessan Boyle" (124–125). The problem is obvious: Ballard, Vonnegut, and Lessing were, by any reasonable standard, "genre" sf writers; and the particular texts by the other writers that Ghosh has in mind—Atwood's *MaddAddam* trilogy, Kingsolver's *Flight Behavior*, McCarthy's *The Road*, McEwan's *Solar*, Boyle's *A Friend of the Earth*—are, again by any reasonable standards, very clearly science-fictional in character. Certainly, they each satisfy the criteria stipulated in Darko Suvin's famous definition of sf as a genre "*distinguished by the narrative dominance or hegemony of a fictional 'novum' (novelty, innovation) validated by cognitive logic*" (63). The problem here lies not with Ghosh's definition of sf, however, but rather with his notion of the "literary." For, as Andrew Milner has argued at length elsewhere, "the binary between Literature and popular fiction is almost entirely an artefact of Literary modernism, designed to valorise form over content, and cannot be applied to sf which, by contrast, is a genre of ideas and therefore privileges content over form" (14). We also have no objection to the term "cli-fi" as a grouping for this type of fiction, as proposed by Bloom, other than a fairly longstanding aversion to the prototypical "sci-fi" from which this neologism derives. Nonetheless, the claim to identify a new *genre* cannot be accepted without serious theoretical scrutiny.

Genre is an aspect of the more general phenomenon of cultural "form," traditionally subject to distinctly "formalist" modes of analysis preoccupied with systems of classification. But, as John Rieder makes clear in an article specifically addressed to sf, more recent cultural criticism has tended towards a "newer paradigm" that "considers generic organizations and structures to be

[...] messily bound to time and place” (“On Defining SF” 193). Rieder draws a sharp distinction between “the pre-existing classical and academic genre system that includes the epic, tragedy, comedy, satire, romance, the lyric” and the emergence during the nineteenth century of “a genre system associated with mass publication that came to include science fiction [...], the detective story, the modern romance, the Western, horror, fantasy, and other similar genres.” The two genre systems, the classical-academic and what he later termed “the mass cultural genre system” are, in Rieder’s view, distinct from and in tension with each other (“On Defining SF” 199; see also his *Science Fiction and the Mass Cultural Genre System*). Like Rieder’s, our approach is historical rather than formalist in character—but we would go further in stressing the necessarily social character of form as a kind of cultural “force of production,” a mechanism for enabling and facilitating cultural communication. As Raymond Williams put it, form is not a matter of classification, but of social relationship, “a social process which [...] becomes a social product. Forms are [...] the common property [...] of writers and audiences or readers, before any communicative composition can occur” (*Marxism and Literature* 187–188).

Whilst we have no doubt that a new system of genre classification did indeed emerge in the nineteenth century, we nonetheless wish to argue that it functions at a different level of analysis—both sociologically and formally—than the classical system, and that the two are not thereby necessarily in conflict. Here again, we resort to Williams, who distinguished three different “levels of form” denoted as, respectively, “modes,” “genres,” and “types.” He reserved the term “mode” for the deepest level of form, as in the distinction between the “dramatic mode,” in which the action is performed before an audience; the “lyrical mode,” that is, the non-mimetic composition of a single voice; and the “narrative mode,” where action is recounted as a tale told to an audience by a teller. Historically, these persist through quite different social orders: “the level of relations involved [...] can be more accurately referred to an anthropological or societal dimension than to the sociological in the ordinary sense [...] they are very general, and their reproduction is at least relatively autonomous” (*Culture* 194). Williams nominated the term “genre” for relatively persistent instances of each mode, as for example in the distinction between tragedy and comedy within the dramatic mode or epic and romance within the narrative mode. Such genres are “significantly more subject to variation between different epochs and different social orders,” he observes, noting that neither the epic nor the romance survived into the modern, bourgeois epoch “at least without radical redefinition” (195). Still

more variable and still more dependent on particular social relations are what Williams termed “types,” that is, “radical distributions, redistributions and innovations of interest, corresponding to the specific and changed social character of an epoch” (196). His examples include “bourgeois drama” and the “realist novel.” On this model sf is a “type” established in nineteenth-century Europe through a radical redistribution of interests towards science and technology within the novel and short story genres of the narrative mode. In the twentieth century, the same concentration of interests persists within the novel and short story genres, but is also redeployed into various theatrical, film, radio, and television genres of the dramatic mode. This model has the great advantage over Rieder’s that it deconstructs, rather than reinforces, the binary between “literary” and “genre” fiction.

If form is a social construct, then the obvious question arises as to how exactly this particular type is socially constructed. Two of Williams’s more general key theoretical concepts—“selective tradition” and “structure of feeling”—can productively be applied to sf at this point. Williams used the term “selective tradition” to denote the way cultural tradition entails “a continual selection and re-selection of ancestors” (*The Long Revolution* 69). For Williams, this argument was directed primarily at the high literary canon, but it can clearly also be applied to what Suvin calls the “SF tradition” (220). This, too, is necessarily a retrospectively selective attempt to establish and maintain kinds of predisposed continuity. So, the genre initially identified as “scientific romance,” later as “scientifiction,” later still as “science fiction,” and now as sf developed by way of a series of competitive struggles to redefine its own tradition selectively by reselecting its ancestors. The most famous example is Hugo Gernsback in 1926 describing the range and scope of *Amazing Stories* as “the Jules Verne, H. G. Wells and Edgar Allan Poe type of story” (3). But these definitions and redefinitions are in no sense arbitrary; rather, they are focused and refocused around the role of science and technology in industrial and post-industrial societies. Here, Williams’s concept of “structure of feeling” becomes relevant as a way to theorize the “historical formation” of a “structure of meanings” as “a wide and general movement in thought and feeling” (*Culture and Society* 17). Williams was particularly insistent that the new industrial science and its technologies were a crucial element in the emergent structure of feeling of mid-nineteenth century Britain. The “excitement of this extraordinary release of man’s powers,” he observed, became “central to the whole culture” (*Long Revolution* 88). It is precisely this element that most clearly distinguishes the new worlds of nineteenth-century sf from older fantastic voyages and utopian islands. And

that is surely also the significance of Mary Shelley's *Frankenstein*: that it imagined biological science as practically applicable to medical technology. This is why Brian Aldiss was right to trace the "origins of the species" to Shelley's novel (*Trillion Year Spree* 25–52). It is also why Victor Frankenstein is still actively present in sf, continuously available as an intertextual reference point in sf literature, film, radio, and television, in a way that is simply not true of either Lucian of Samosata's King Endymion or Sir Thomas More's Raphael Hythlodæus.

We would argue that contemporary climate fiction is a subgenre of sf rather than a distinct and separate genre for two main reasons. First, both its texts and practitioners—writers, readers, publishers, film directors, fans, etc.—relate primarily to the sf selective tradition. Most of its key exponents—for example, Kim Stanley Robinson in the USA, Jean-Marc Ligny in France, Dirk C. Fleck in Germany—both self-identify as sf writers and are identified as such by the wider sf community. Robinson has won two Hugo Awards for Best SF Novel; Ligny has won a series of French SF awards, including the Prix Bob Morane, the Prix Rosny Aîné, the Prix Une autre terre, and the Prix Julia Verlanger; Fleck has twice won the Deutscher Science Fiction Preis. Moreover, cli-fi writers inclined to refuse the generic label—Atwood in Canada or Jeanette Winterson in England—normally do so on the grounds that their work is "literary" rather than "genre" fiction. Second, both climate fiction's texts and its practitioners articulate a structure of feeling that accords centrality to science and technology, in this case, normally climate science. As Robinson says in his "Introduction" to the omnibus edition of the *Science in the Capital* trilogy: "Science itself is the genius AI that we fear to create; it's already up and running. Attend to it and act on what you learn. It's the science fiction way" (*Green Earth* xiv–xv). Neither of these conditions—those established by the selective tradition and those by the structure of feeling—are set in stone. It is, of course, possible that cli-fi will, at some time in the future, evolve into a comparatively autonomous genre, with its own selective tradition and its own structure of feeling, but this has not occurred as yet.

Not only is cli-fi best understood as sf, it also has a much longer pre-history than Bloom allows, which arguably stretches back to antiquity. The most famous of all climate fictions is almost certainly the story of Noah in Genesis VI–VIII, but it is clearly not sf, nor is the climate change it envisages properly speaking the result of human actions. Extreme climate change is, of course, the novum driving the Noah narrative, but the story's logic is nonetheless strictly theological; the causes of its great flood not so much *anthropogenic* as what we might call *theogenic*. Human iniquity prompts Yahweh to launch the

flood, but there is nonetheless no direct causal connection between the iniquity and the flood; rather, the latter follows as a result of Yahweh's own choice, which is why he can promise later in the story never to repeat the exercise. Prior to the emergence of modern sf, extreme climate change was normally represented in fiction either as theogenic or as what we might call *geogenic*, that is, the result of such terrestrial natural causes as earthquakes. The second motif, though not the first, persists into contemporary sf, especially by way of new-ice-age fictions. But with the emergence of sf as a genre centered on the consequences, for better or worse, of the potential for human mastery of nature by way of science and technology, it also became possible to imagine properly anthropogenic extreme climate change. And, once humanity had itself been imagined as capable of transforming a planet's climate, then it was but a small step to imagine alien species capable of producing what we could call *xenogenic* climate change. This essay is intended as a brief sketch of the (pre-)history of stories of theogenic, geogenic, anthropogenic, and xenogenic extreme climate change, all of which predate contemporary cli-fi.

Flood Narratives

Treatments of catastrophic climate change in sf have tended to be organized around three main tropes: the drowned world, the freezing world, and the warming or burning world. Of these only the first has a deep history in the Western mythos, dating back to the Genesis story of Noah and arguably, before it, to the story of Ūta-napišti in the Epic of Gilgamesh (Tablet XI). In both, the causes of climate change are theogenic. Whether the story of Noah derives from that of Ūta-napišti, or both derive from some even older common source, there is no denying either the power of the flood narrative or its enduring influence over subsequent Judeo-Christo-Islamic cultures. There are no equivalent ice or fire narratives in any of the extant Akkadian or Hebrew sources. Unsurprisingly, then, when modern sf began to take shape in the early nineteenth century, it inherited this preoccupation with the great flood from its parent cultures: witness, for example, both Mary Shelley's 1826 novel *The Last Man* and Richard Jefferies's 1895 *After London*.

Shelley's second sf novel is fundamentally a plague narrative rather than a climate fiction, the prototype for all the subsequent stories of species-destroying diseases, just as *Frankenstein* was the prototype for all subsequent stories of insubordinate manmade intelligences. The final chapters of *The Last Man* do, however, bring together representations of a flooded city, a terrible

storm, and the destruction of all but one man, in ways that are powerfully resonant with Genesis and Gilgamesh. At the beginning of the novel's third volume, the remaining plague survivors abandon England in search of a better climate. Eventually four reach Switzerland: the narrator and eventual "last man," Lionel Verney; his close friend, Adrian Earl of Windsor; Verney's niece Clara; and his son Evelyn. Evelyn eventually dies of typhus and the three survivors travel towards Venice, intending to continue on to Rome. Venice is, of course, normally a city of canals, but bereft of humanity it takes on all the characteristics of a genuinely flooded city (*Last Man* 261–262). The travelers therefore decide to turn away from Rome and sail to Greece: "Ocean, we commit ourselves to thee—even as the patriarch of old floated above the drowned world, let us be saved, as thus we betake ourselves to thy perennial flood" (263). The reference to Noah, who was himself also in a sense a last man, is obvious. But where he and his family had survived, the terrible storm that now blows up in the Adriatic wrecks the tiny craft and drowns both Adrian and Clara. Verney swims ashore near Ravenna, travels to Rome, where he stays for a year while writing *The Last Man*, and finally, in the novel's closing lines, announces his intention to sail around the world (279).

Like *The Last Man*, Jefferies's *After London* is not strictly speaking a climate fiction: the flooding of London is an effect of unexplained catastrophe—perhaps overdevelopment—rather than climate change. It is, however, very definitely a flood narrative. The novel comprises a five-chapter "Relapse into Barbarism," which gives an account of the fall of London written by a much later historian and which includes detailed descriptions of an England reclaimed by nature, and a twenty-eight-chapter "Wild England," which recounts the adventures of Felix Aquila many years later in a pseudo-medieval landscape, including a visit to the remains of the fallen city. What was once London and the Thames Valley is now occupied by a "great Lake in the centre of the island" (Jefferies 25). Most of the Lake is clear freshwater, but over the site of old London there are only tepid marshes (27). When Felix and his canoe are swept into those marshes, he is appalled to discover that: "the deserted and utterly extinct city of London was under his feet" (128). He eventually manages to escape, but such is the filth of the city that he and his canoe are thoroughly blackened by it (131). Just as Shelley had invoked the Genesis flood narrative to imagine the end of the human race, so Jefferies invokes it—in ways that oddly anticipate William Morris's *News from Nowhere* (1890)—to imagine the end of industrial capitalism.

All these texts—and many others besides—tell of floods that destroy or damage human civilization, but which are never strictly anthropogenic. There

is, however, a limit text, published only six years before *After London*, where anthropogenically produced rising sea levels are anticipated but nevertheless not actually realized: Jules Verne's *Sans dessus dessous* [*Topsy Turvy*] (1889). After *Vingt mille lieues sous les mers* [*Twenty Thousand Leagues Under the Seas*] and *L'île mystérieuse* [*The Mysterious Island*], Verne's two best-known novels are almost certainly *De la terre à la lune* [*From the Earth to the Moon*] (1865) and *Autour de la lune* [*Around the Moon*] (1870). Much less well-known is the third in this "Baltimore Gun-Club" trilogy, *Sans dessus dessous*, in which the same three American characters, Impey Barbicane, J.-T. Maston and Captain Nicholl, come out of retirement, planning to use the recoil of a huge cannon—the same technology as in the earlier novels—to shift the tilt of the Earth's axis so that it becomes perpendicular to the planet's orbit. As a result, the vast coal deposits under the polar ice cap will be made available for mining (*Sans dessus dessous* 93-94). The Gun-Club is planning for nothing less than intentionally induced anthropogenic climate change, in which the relocation of the poles will result in their being melted by the sun. One is struck by Verne's prescience—this kind of melting and mining, if not the tilting, is exactly what has been envisaged by twenty-first-century governments in Canada under Stephen Harper, in Russia under Vladimir Putin and, we fear, in the United States under Donald Trump. Despite international attempts to obstruct their efforts, Barbicane and Nicholl succeed in firing a 180,000-ton steel-braced rock from the cannon located in the side of Mount Kilimanjaro, using a new "melimelonite" explosive invented by Nicholl. The explosion causes enormous localized damage, but nonetheless has no apparent effect on the Earth's axis (196). The explanation is reassuringly simple: Maston has made a crucial mistake in his calculations, by accidentally erasing three zeros during a telephone call from the widowed Mrs. Scorbitt, who largely financed their project (204). The novel's conclusion—that the inhabitants of the world can sleep easily, safe in the knowledge that the Earth's axis cannot be shifted (208)—is reassuring. But twenty-first-century readers might sleep less well, for other powerful processes are now at work that may indeed someday melt the ice caps.

Gernsback published a complete English translation of *Sans dessus dessous* under its British title *The Purchase of the North Pole* in the September and October 1926 issues of *Amazing Stories*. Thereafter, catastrophic floods became a pulp staple. In *Amazing Stories* itself, Geoffrey Hewelcke had the Earth beset by earthquakes, floods, and tidal waves in a desperate attempt to shift its orbit so as to avoid collision with a comet; Clare Winger Harris had earthquakes and floods caused by a deliberate Martian attempt to use

the Earth as a Sun shield; A. Hyatt Verill had massive tidal waves brought about by a shift in the Moon's orbit; Victor Endesby had Ben, his new Noah, build an ark to escape the flooding of California; J. Lewis Burt had the ice caps melt and flood the Earth as an indirect result of a meteor strike on the moon; Stanley G. Weinbaum had earthquakes cause the flooding of Central America and thence far-reaching changes in global climate; Thornton Ayre had cyclical changes in the Earth's climate generate the greatest floods in the planet's history. In *Wonder Stories*, J. M. Walsh had a comet shift the Earth's tilt, leading to melting of the ice caps, global flooding, and the destruction of most of humanity; Lloyd Arthur Eshbach had alien invaders melt the ice-caps and flood the world; Morrison Colladay had a meteor strike cause earthquakes and tidal waves that flood New Orleans and eventually the entire lower Mississippi. In *Astounding*, M. F. James told of how a gigantic alien spaceship caused tidal waves, earthquakes and the disappearance of the Atlantic Ocean into the sky.

These American pulp fictions are clearly indebted to Genesis and some also to *Sans dessus dessous*, but none seem closely related to scientific concerns about the real possibilities for global warming. The same is true of the two main British sf flood narratives of the 1950s and early 1960s, John Wyndham's *The Kraken Wakes* (1953) and J. G. Ballard's *The Drowned World* (1962). In *The Kraken Wakes*, floods are part of "Phase Three" of an alien invasion by kraken sea creatures; in *The Drowned World*, they are the effect of persistent solar flares. Unlike Wyndham, Ballard made the connection between warming and flooding, but neither novel is interested in scientifically plausible models of global warming. And of course *The Drowned World* is not really about climate change at all. It was widely applauded instead for the introduction of a new seriousness into the genre, especially for the psychoanalytic preoccupations of both its author and its central protagonist, Dr. Robert Kerans. As Kerans observes, in lines that summarize Ballard's own central conceit, "as psychoanalysis reconstructs the original traumatic situation in order to release the repressed material, so we are now being plunged back into the archaeopsychic past, uncovering the ancient taboos and drives" (*The Drowned World* 42–43). As the planet reverts to the Triassic, so individual psychology reverts to the lizard brain. As science this is nonsense, as is the immediately following non-sequitur that humans are "as old as the entire biological kingdom, and our bloodstreams are tributaries of the great sea of its total memory" (43). As fiction, however, it allows for a hauntingly dreamlike transformation of central London into a landscape of exotically beautiful tropical lagoons. It is as if Shanghai had come home to Chiswick—which, in a way, it had.

The Kraken Wakes is perhaps the most famous of all stories of xenogenic climate change. Here, Wyndham gives us a detailed account both of the catastrophe itself and, more importantly, of the human responses thereto. The kraken force the polar ice caps to calve into myriad icebergs, which in turn increases sea levels by hundreds of feet, thus producing drastically decreased global temperatures. Wyndham's novel is narrated by Mike Watson, reporter for a thinly disguised BBC, and describes the human reactions to the kraken by way of his own reportage and that of his wife Phyllis. The leading scientist character, Professor Alastair Bocker, realizes that the effects of melting will be progressive: "First a trickle, then a gush, then a torrent [...] The only certainty is that the sea-level would indeed rise [...] I draw attention to the fact that in January of this year the mean sea-level at Newlyn, where it is customarily measured, was reported to have risen by two and a half inches" (Wyndham 238). Phyllis berates Bocker for this combination of understatement and alarmism (239–240). Especially interesting here is the way Wyndham's fiction prefigures more contemporary debates between climate scientists and climate skeptics. The outcome might also be prefigurative: water streams along the Thames Embankment, bursts through the riverside walls, and cascades on to the roads (257).

This tradition of Genesis-inspired flood narratives, divorced from any properly scientific concerns over climate change, continues into the twenty-first century. In the British sf novel, Stephen Baxter's *Flood* grounds often powerfully plausible depictions of inundation as catastrophe on the most tenuous of scientific bases, the supposed existence of underground oceans located beneath the Earth's mantle (*Flood* 472–473). In American sf cinema, Roland Emmerich's *2012* based its spectacularly successful special effects on the spurious notion that a barrage of neutrinos unleashed by solar flares would produce global earthquakes and megatsunamis. Both Baxter and Emmerich gesture toward their Hebrew sources; both make extensive use of the notion of a flooded Mount Everest, the obvious contemporary counterpart to Genesis's Mount Ararat; the sequel to *Flood* is entitled *Ark*, although there are actually three arks rather than one, and *2012* also has three surviving arks, which endure a twenty-seven day deluge to converge on the Drakensberg Mountains at the Cape of Good Hope, in a scene that, once again, clearly alludes to Noah at Ararat.

If neither Wyndham nor Ballard, Baxter nor the Emmerich of *2012* countenanced the possibility of anthropogenically produced rising sea levels, the same cannot be said of Japanese writer Kōbō Abe's novel *Dai-Yon Kampyōki* [*Inter Ice Age 4*] (1958–1959), which is often claimed as the foundational

text of postwar Japanese sf. Its combination of paranoid apocalypse, cruel evolutionism, and the weirdly surreal sometimes seems reminiscent of Ballard, but also anticipates Haruki Murakami. Certainly, both Abe and Murakami are heavily indebted to traditions of western fantasy and sf writing. The primary concerns in *Dai-Yon Kamyōki* are not with climate change but rather with the philosophical dilemmas created for its protagonist, Professor Katsumi, when the computer system he develops to predict human behavior begins to predict his own. The computer also predicts that rising sea levels will threaten humanity and, as a result, government scientists plan to genetically engineer gilled humans. This is the novel's—and Katsumi's—central dilemma: whether or not to cooperate in the development of these aquans. Moreover, the main cause of rising sea levels is not human CO₂ emissions, but rather an apparently unprecedented level of volcanic activity on the ocean floor. With Abe, then, we reach yet another limit text, which actually acknowledges the possibility of anthropogenically induced global flooding, but only so as to set it aside.

Cooling Narratives

Cooling and warming are more recent preoccupations than flooding, dating essentially from the widespread acceptance of ice age theory following the publication of James Croll's *Climate and Time in Their Geological Relations* in 1875 and of greenhouse theory, following Svante Arrhenius's *On the Influence of Carbonic Acid in the Air upon the Temperature of the Ground* in 1896. For most of the twentieth century both science and sf were more interested in cooling than in warming. In geological terms, the period we inhabit, the "Holocene," is an "interglacial," that is, a comparatively warm period within the longer, colder "ice age" defined by the "Quaternary period." When located in relation to the so-called "Milankovitch cycles," which measure the effects of orbital variation on the Earth's climate, we can be seen to live in a time of cooling that has lasted for some 6000 years. So the most likely future climate change was widely anticipated to be a return to the ice age. This motif recurs throughout the sf of the period, from American pulp sf through John Christopher's *The World in Winter* (1968) to Michael Moorcock's *The Ice Schooner* (1966), Douglas Orgill and John Gribbin's *The Sixth Winter* (1979), and Jean-Marc Rochette and Jacques Lob's graphic novel *Le Transperceneige* (1984).

Pulp sf borrowed the ice motif from climate science, but normally without much interest in or understanding of ice age theory. Only two of the stories

we examined were predicated on reasonably plausible versions thereof. The ending of R. F. Starzl's "If the Sun Died," published in *Astounding Stories*, has the human race in the far distant future discover that their sun hasn't actually died, but rather that the planet has undergone periodic glaciation. Warner Van Lorne's "Winter on the Planet," published in the same magazine, has humanity respond to a new ice age by living underground in ice caves. Elsewhere, however, the big freeze turns out to be significantly less plausible scientifically. So, when Paul H. Lovering's Earth grew cold in *Amazing Stories Quarterly*, it was because an "ice nebula" had enveloped the solar system; when Bruno H. Buerger's did in *Wonder Stories Quarterly*, it was because it passed through a cosmic cloud which cut off solar radiation; when Henry J. Kostkos's did in *Amazing Stories*, a planetoid had stripped away the Earth's atmosphere; when Chan Corbett's did in *Astounding Stories*, the sun had simply cooled, as it did for Eando Binder, again in *Astounding Stories*. Sometimes the freezing was a result of human action: Jack West's "When the Ice Terror Came," published in *Amazing Stories*, had scientist August Hess invent freeze machinery as a means to end the war in Europe; Arthur J. Burks's "White Catastrophe," published in *Thrilling Wonder Stories*, had scientist Jose Pindobal aim to win fame by making the Tapajos River freeze over; Frederick Pohl's "The Snowmen," in *Galaxy Science Fiction*, had the reckless use of domestic heat pumps lower outside temperatures to the point of an anthropogenically generated new ice age. Occasionally, these ice ages can be xenogenic: Jack Williamson's "The Ice Entity," in *Thrilling Wonder Stories*, had an alien capable of mind control attempt to blot out the sun. Robert Silverberg was a regular contributor to *Amazing*, *Astounding*, *Galaxy*, and other pulps, but his *Time of the Great Freeze* (1964) was actually published as a separate young adult fiction. Set in 2650 AD, some 350 years after the onset of the next ice age, the human race now lives in plausibly realized underground cities. Dr. Raymond Barnes, his son Jim, and a small party of would-be explorers suspect that the ice has begun to thaw, are given permission to travel to the surface, make radio contact with survivors in London, and then set off on what must be the greatest of treks, making their way eastwards from New York across the frozen wastes of what was once the Atlantic Ocean. The novel is very loosely indebted to geological ice age theory, although its few centuries of ice represent a disconcertingly short period by comparison with the 95,000 years of the last glacial.

Christopher's *The World in Winter* and Orgill and Gribbin's *The Sixth Winter* are each by comparison much more scientifically plausible. Both envisage the next ice age as geogenic, that is, as an essentially natural cyclical

process, as it almost certainly will be; both are set in the near future; and both represent the onset of glaciation as occurring very rapidly, which is a matter for dispute amongst climate scientists. Although all three authors were English, only *The World in Winter* is written from a distinctly British vantage point. In *Christopher*, the freeze develops over the course of a single prolonged English winter, so that food stocks fall dangerously low, rationing is introduced, and martial law imposed. Whilst those with the wherewithal flee south to the tropics, the protagonist, television producer Andrew Leedon, remains behind in the “London Pale,” the UK Government’s protected area, cordoned off from its wider territory, which has in effect been consigned to starvation. Hence, the memorable opening sequence in the British Museum Reading Room (*Christopher* 7–8). Eventually, Leedon and his lover Madeleine Cartwell escape to Nigeria, where European refugees from the frozen north live in slums and are typically either unemployed or employed in low-status jobs. This reversal of roles between the onetime imperial metropolis and its onetime colonies is what most interests *Christopher*, but the new ice age is the key science-fictional novum nonetheless. The novel offers the reader a much less “cozy” version of catastrophe than those in *Wyndham*; and, although there is some slight hope at its conclusion, it must have seemed far less reassuring than *The Kraken Wakes* to English middle-class readers of the 1950s.

Orgill and Gribbin’s *The Sixth Winter* is even more persuasive scientifically, as might be expected from a writer like Gribbin, who was by profession an astrophysicist. Its protagonist, climatologist Dr. William Stovin, warns the US President at a meeting of the National Science Council that the transition to the new ice age will occur rapidly rather than gradually (Orgill and Gribbin 31). Stovin is invited to Novosibirsk in the Soviet Union, where the initial crisis appears at its most extreme, and is witness to the dramatic disruption of Siberian material and social structures, as he and his Russian and American colleagues flee towards Alaska. The strong sense that this is a natural cyclical phenomenon, as evident for example in how wolves possess a kind of collective memory of previous ice ages—a recurrent motif from first page to last (9, 349)—powerfully attests to the logic of ice age theory. At one level, *The Sixth Winter* is the story of a great trek across a hostile icescape, an echo of the closing sequences of Ursula K. Le Guin’s *The Left Hand of Darkness*. The same motif also informed Moorcock’s *The Ice Schooner*, originally serialized in Keith Roberts’s British sf magazine *Science Fantasy/Impulse* during 1966.

In his “Introduction” to its 1993 reprint, Moorcock claims retrospectively that “Since the 1950s British sf in particular [...] has been obsessed with

environmental change” (iii). The contrast between British and American sf is well taken, although Aldiss actually fits Moorcock’s case better than Ballard. But, as for *The Ice Schooner* itself, Moorcock surely protests too much. The novel depicts a plausibly human distant-future society, which has successfully adjusted to the extreme conditions of the new ice age. The Eight Cities of the great ice plateau, which “covered the part of the world once known as the Matto Grosso,” (2) now inhabit an entirely arctic world. The novel’s protagonist, Konrad Arflane, is a man of the ice, a captain of ice ships, hunter of strange whale-like creatures who have evolved to live on the ice, and a fervent believer in the religion of the Ice Mother. His certainties are tested, however, when the Lord Rorsefne insists that the legendary city of New York does in fact exist (47). So Arflane and his crew set off on their own trek across the ice, in search of the ice city and the Ice Mother. All this is well handled, but New York itself turns out to be disappointingly trite. Peter Ballantine, the condescendingly superior man of the future who saves Arflane from barbarians, simply explains away the entire world in a few short pages. The ice age was not a natural-cyclical development, it turns out, but rather the effect of nuclear war; the people of the Eight Cities are the descendants of scientist-survivors from Antarctica, the high-tech New Yorkers those of scientist-survivors from Greenland; and now, at last, the world is warming and the New Yorkers will lead the way into a happier future (175–177). A powerfully imagined ice world—and with it the novel’s only truly interesting character—is discarded in favor of the most banal of techno-utopias.

Le Transperceneige [*Snowpiercer*], drawn by Jean-Marc Rochette and scripted by Jacques Lob, is a “bande dessinée,” or BD, what English speakers would term a graphic novel. It is set during a near-future ice age, at a time when all surviving human beings inhabit a single train called *le Transperceneige*. As the opening frames tell us, the train never stops, and is one thousand and one carriages long (9). In 2013 a Korean film adaptation directed by Bong Joon-ho was released by Moho Films as *Seolgunnyeolcha*, and in the following year released in the USA as *Snowpiercer*; the story is now coming to television. The film quite specifically claims that its new ice age is the result of a spectacularly over-effective attempt to counter global warming. There is no such suggestion in the original novel. Nor, however, is the disaster the result of natural-cyclical processes. Rather, Rochette and Lob strongly hint that the world has been destroyed by fearsome new climate weapons (Rochette and Lob 71, 82). This is closer to Moorcock than to Bong, its real-world referent, nuclear war, metaphorically recast as climate

war. Like *The Ice Schooner*, *Le Transperceneige* is centered on a powerfully imagined ice world, here comprising both the recurring image of the train's 1,001 carriages ploughing through the surrounding snowbound landscapes and the vicious social structures that operate aboard them. Unlike in *The Ice Schooner*, however, no easy techno-utopian solution is available to the travelers aboard *le Transperceneige*. Indeed, the conclusion, with passengers and crew apparently wiped out by plague and the hero-protagonist Proloff left entirely alone to tend to Olga, the engine, is much darker than in *Moorcock*. Nonetheless, both novels use the ice age trope in the same fashion as the American pulps, that is, without much evidence of interest in or knowledge of current scientific speculation about the possibility or likelihood of a new real-world ice age.

Warming Narratives

By comparison with the extensive use of flood and ice narratives in twentieth-century sf, warming—as distinct from flooding—seems only rarely to have engaged the genre. Lowell Howard Morrow's "Omega, the Man," in *Amazing Stories*, imagined a far-distant future Earth having lost both atmosphere and water, but this was more a matter of dying out than of drying out. The one key sf text that does focus very deliberately on warming is Ballard's 1964 *The Burning World*, which addresses the issue in characteristically apocalyptic terms. The novel opens in the township of Hamilton, located somewhere on the shores of a rapidly disappearing inland lake. The main characters—Dr. Charles Ransom, his estranged wife Judith, his friend Philip Jordan, Jordan's blind foster father, the witch-like Mrs. Quilter, and the zookeeper Catherine Austen—all sooner or later join the exodus towards the sea, where desalinization remains possible. This global drought has been caused by long-term pollution of the seas, which has eventually produced a "thin but resilient mono-molecular film formed from a complex of saturated long-chain polymers" that prevents "almost all evaporation of surface water into the air space above," thus permanently stalling the evaporation-precipitation cycle (*The Drought* 47). This doesn't sound terribly plausible scientifically. But Ballard's main concerns, as in *The Drowned World*, are not so much with climate science and climate change as with reverse-evolution to the primeval lizard brain. And, as in *The Drowned World*, this dubiously post-Jungian exploration of the collective unconscious is combined with spectacularly surreal images of a desolate post-urban landscape (130).

Global warming is a more recent and less developed science-fictional concern than even the new ice age, and it too was originally only tangentially related to the real-world concerns of climate science. This observation requires radical qualification, however, for the last quarter of the twentieth century. Widespread scientific concern that anthropogenic warming might more than offset longer-term cooling becomes increasingly urgent from the late 1970s onwards. In 1979, both the US National Research Council and the World Meteorological Organization published predictions that then-current levels of CO₂ emission would result in increases in average global temperature. In the early 1980s, Eugene F. Stoermer coined the term “Anthropocene” to describe the two centuries since the beginning of the Industrial Revolution and, in 2000, he and Paul Crutzen formally proposed it to the International Geosphere-Biosphere Program; in 1988, the World Meteorological Organization and the United Nations Environmental Program combined to establish the Intergovernmental Panel on Climate Change (IPCC); and, in 1990, the IPCC completed its *First Assessment Report*. This concluded that emissions from human activities had substantially enhanced the natural greenhouse effect; that CO₂ emissions were responsible for more than half the enhanced greenhouse effect; and that, if emissions proceeded on a “business as usual” basis, this would result in levels of global warming during the twenty-first century greater than those seen in the previous 10,000 years (Houghton xi). Where science—and also, in a small way, Kōbō Abe—had led, sf would follow. In 1977, the American Arthur Herzog explored the fictional possibilities of a runaway greenhouse effect in his novel *Heat*. A decade later, the Australian George Turner’s *The Sea and Summer* depicted a world of mass unemployment and social polarization, in which global warming had produced rising sea levels and consequent inundation of the city of Melbourne’s Bayside suburbs.

It would be rash to claim that *Heat* and *The Sea and Summer* are the very first instances of contemporary cli-fi—how could we possibly be sure?—but they are certainly unusually early examples. There is, in fact, a passing mention of global warming in Ursula Le Guin’s novelette *The New Atlantis* (1975). But, as with Kōbō Abe, this text explicitly downplays the significance of anthropogenic climate change in favor of a focus on tectonic and volcanic changes, and, even more centrally, political authoritarianism. We might also have included Brian Aldiss’s *Helliconia* trilogy (1982–1985), except that its subject matter is climate change on another planet rather than on Earth. In its first two volumes, the narrative is driven by the climate change produced by the Great Year of Helliconia and the Batalix-Freyr binary system which

determines it. In the third volume, this role is played by the Original Beholder on Helliconia and Gaia on Earth, which turns it into a kind of “deep ecology” sf. But *Heat* and *The Sea and Summer* nonetheless mark a decisive turning point in this kind of writing.

Both Herzog and Turner were professional writers and journalists with relatively well-established careers in sf, and both seem to have been drawn to the global warming topos as a continuation of and extension from their earlier sf, occasioned by awareness of and interest in current scientific debates. *Heat*'s central protagonist is Dr. Larry Pick, a brilliant, dedicated engineer, former full professor at MIT, and now Deputy Director of CRISES, the Center for Research Investigation and Systems Evaluation Service, a Government-funded center for disaster research. In short, Pick is the latest incarnation in a long tradition of pulp sf scientist-heroes. The novelty here, however, lies in the fact that he is an environmental scientist as well as an engineer; and that his computer modellings point to the increasing likelihood of a runaway greenhouse effect. But, as so often in the pulp tradition, Pick's efforts are impeded by colleagues with bureaucratic rather than scientific ambitions, notably the Director, Rufus Edmunston, Pick's successor as Deputy Director, Hal Anderson, and White House apparatchik Joseph Banner. But the developing climate crisis confirms Pick's analyses. He assembles a team to pursue the problem—including his eventual lover, the disaster sociologist Rita Havu—all of whom work in a state-of-the-art underground laboratory, The Hole, using a state-of-the-art computer, ILLIAC. These are, of course, further reworkings of familiar sf tropes. But the scientific detail and moral seriousness of the cautionary tale is less familiar. As the junior climatologist Benjamin Blake explains, “A runaway greenhouse effect is just about the only conceivable way the world *could* end” (Herzog 42). As the greenhouse effect does indeed begin to run away, the US Government enforces conventional mitigation policies so as to reduce emissions. There are bans on the production and use of power tools, lawnmowers, electric blankets, electric toothbrushes, electric tin openers, garbage disposal units and microwave ovens, a ban on all unnecessary driving, and other “frivolous consumption of energy” (239). But these are only short-term measures. The eventual solution and the novel's denouement lie in climate engineering, by way of Pick's design and testing of an artificial “earth-sun,” a system of mirrors placed in orbit around the Earth that will focus the sun's rays on terrestrial receiving stations, which then transmit their heat back into space. This kind of technofix is yet another classic pulp sf trope, as is the essentially optimistic conclusion in which the scientist-hero both saves the world and gets the girl (250).

The Sea and Summer is a more sophisticated, more formally complex novel. It is organized into a core narrative comprising two parts set in the mid twenty-first century and a frame narrative comprising three shorter parts set a thousand years later amongst “the Autumn People” of the “New City” in the Dandenong Ranges, to the east of the present site of Melbourne (Turner 3–16, 87–100, 315–316). The latter depicts a utopian future society in a slowly cooling world, which uses submarine archaeology to explore the remains of the “Old City.” The novel opens by introducing the frame narrative’s three main characters: Marin, a part-time student and enthusiastic Christian, who pilots the powercraft used to explore the drowned city; Professor Lenna Wilson, an expert on the collapse of the “Greenhouse Culture” in Australia, who teaches history at the University; and Andra Andrasson, a visiting actor-playwright, researching the twenty-first century as possible material for a play (3–6). They explore the remains of the submerged city and debate their meaning both on-site and at the University. The core narrative is a novel within a novel, also entitled *The Sea and Summer*, written by Lenna as an “Historical Reconstruction” of the thirty-first-century’s real past (15). It traces the development of the Greenhouse Culture through a set of memoirs and diary extracts written by five key protagonists, Alison Conway, Francis Conway, Teddy Conway, Nola Parkes, and Captain Nikopoulos, during the years 2044–2061. Thus, where the narrative voice in Herzog is that of the omniscient author, Turner’s text is deliberately polyphonic. And where Herzog’s narrative proceeds by simple chronology, Turner’s core narrative is counter-chronological, beginning and ending in 2061, but moving through the 2040s and 2050s as it develops.

At the opening of the core narrative, the poor “Swill” live in high-rise tower blocks, the lower floors of which are progressively submerged by rising sea levels, the wealthier “Sweet” live in suburbia on higher ground. In 2033, a third of Australia has been set aside for Asian population relocation; by 2041, the global population has reached ten billion and the cost of iceberg tows and desalinization projects has brought the economy close to bankruptcy (29–30). On his sixth birthday in 2041, Francis Conway and his nine-year-old brother, Teddy, are taken by their parents, Alison and Fred, to see the sea. What they find is a concrete wall stretching out of sight in both directions. Francis’s mother surprises him by explaining that: “This is Elwood and there was a beach here once” (23). The beach gives the novel its title: in 2061, Alison will recall her delight in it, observing that the “ageing woman has what the child desired—the sea and eternal summer” (20). In the interim, Fred has been laid off and commits suicide in 2044, leaving her and her boys to move to Newport

(30–34). There they meet Billy Kovacs, the Tower Boss, who becomes Alison’s lover, Francis’s mentor and the reader’s guide to the social geography of an Australian dystopia.

Both *Heat* and *The Sea and Summer* bear the clear impress of their geographical points of production. In *Heat*, warming occurs first and foremost in America itself as the Atlantic heats up. As Anderson explains: “America’s enormous energy use and resulting heat output [...] aggravate the problem, making already unstable atmospheric conditions worse” (Herzog 119). This is nonsense as science, but perfectly plausible as literary geopolitics. *The Sea and Summer* is similarly inflected geopolitically. Here, the state takes over the administration of the Australian economy when the world financial system collapses during the 2040s (Turner 71). At this point, even Australian readers are left wondering what exactly has happened to the international parent companies of Australian subsidiaries, to the World Bank, the International Monetary Fund, the General Agreement on Tariffs and Trade, the US Federal Reserve Bank, the European Central Bank, the People’s Bank of China, and so on. And for non-Australian readers, the question becomes more pressing and more general: what exactly has happened to the rest of the world? The fact that both novels are more or less oblivious to the wider world beyond their respective national frontiers might explain why neither has been translated into any of the other major sf languages: French, German, Russian, Polish, Czech, Japanese, or Chinese. Nor has either been subsequently adapted for film or television. In the case of *Heat* this is especially surprising, given that two of Herzog’s other novels were in fact made into films. We are unsure as to how to explain this, but it does seem likely that the very earliness of these early cli-fi texts impeded both their translation and adaptation. In short, the markets simply weren’t ready. Here, however, we must end our short pre-history. For in the decades that followed—and most especially in the early twenty-first century—global warming would become a defining preoccupation of both print and film sf.

To summarize, then, the findings of this pre-history. Of the three main cli-fi tropes of flood, cooling, and warming, only the first has a long history, dating at least from Genesis and arguably from The Epic of Gilgamesh, and extending right through into modern sf; these texts tell of disastrous floods that are nonetheless never strictly anthropogenic and are only rarely associated with scientific concerns about global warming. Cooling is a much more recent concern, dating primarily from the early twentieth century; cooling texts borrow the new-ice-age trope from climate science, whilst nonetheless rarely making use of the science itself. Warming is an even more recent and

until the twenty-first century an even less developed science-fictional concern, often only tangentially related to the concerns of climate science—but in the twenty-first century real-world scientific anxieties about the prospect of global warming do finally give rise to the burgeoning contemporary subgenre Bloom describes as cli-fi. The novelty of this latest stage in the long history of climate fiction is thus to be found precisely in its comparative fidelity to the findings of the relevant sciences. In short, contemporary cli-fi is, by comparison with its predecessors, above all a *science* fiction.

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