Imagine what a free sky must have looked like, terrifyingly studded with the visible worlds of space."1

TERRAFORMING, under the incarnation of geoengineering (terraforming confined to Earth), has become an increasingly important aspect of the contemporary environmental debate over solutions to climate change.2 The idea of terraforming has risen to become a major motif for ecological and enviro-ethical enquiry within philosophical, political and scientific discourse. The possibilities that sf offers for engaging with the question of the human relationship to non-human nature in the light of the contemporary environmental crisis builds on a tradition that has its roots in the early scientific romances of H.G. Wells, Olaf Stapledon, and others. Sf's early development of terraforming and proto-Gaian motifs for ecological and socio-political enquiry are not limited to these examples of scientific romance, but have found a counterpart in the American pulp sf of the 1930s. Research at the Science Fiction Foundation Collection, housed at the University of Liverpool's Special Collections archive, has offered opportunities to investigate pulp sf's early engagement with ecologism in the 1930s-1940s. Consideration of the specific ways in which the 1930s-1940s pulp tradition developed these motifs brings to light the roots of a tradition that has become increasingly urgent in the light of contemporary environmental concerns.

A cluster of three American pulp sf short stories that featured proto-Gaian living worlds or galaxies appeared between 1932 and 1934. Edmond Hamilton's 1932 short story "The Earth Brain," later collected in The Horror on the Asteroid and Other Tales of Planetary Horror (1936, repr. 1975) and Acolytes of Cthulhu (2001),3 was first published in Weird Tales and foregrounds elements of an aesthetic that H.P. Lovecraft designates as "weird" ("Supernatural Horror in Literature"). Hamilton regularly contributed to Weird Tales, a publication that tended to specialise in the supernatural and sword and sorcery, but which also featured many works of (often horror-inflected) sf. Jack Williamson's Astounding story "Born of the Sun" (1934) was advertised by F. Orlin Tremaine in his editorial epigraph as a “vivid, comfort-destroying story – a thought variant that will thrill you and make you wonder!” It was with this policy of thought experimentation that Tremaine actively began to encourage writers to improve the quality of their stories. This story was first republished in Isaac Asimov's anthology Before the Golden Age (1974). In the same year in Wonder Stories Laurence Manning anticipated the sentient stars and nebulae of Olaf Stapledon's Star Maker in "The Living Galaxy" (1934), later collected in The Science Fiction Galaxy (1950), in Visions from the Edge (1981) and in Creations (1983), the latter co-edited by Asimov.

Serialised in Wonder Stories under the influential editorship of David Lasser in the same year as H.G. Wells' The Shape of Things to Come (1933), Manning's "The Man Who Awoke" uses the Rip Van Winkle device to allow a time traveller to explore several future societies, the first of whom engage in conservation that encourages economic sustainability and stewardship of the Earth. Like Williamson's "Born of the Sun," it was collected by Asimov in Before the Golden Age (1974), but had first been reprinted as a three part serial in the magazine Captain Future in 1941 (a companion to Thrilling Wonder Stories) and in full in the reprint magazine Famous Science Fiction in 1967. This story reflects
on the industrial overuse of natural resources and explores, using the language of ecological resource management, the shape of a future arboreal society. Manning’s presentation of a planetary environment that has been actively forested and managed according to ecological principles positions this text as an early example of a geoengineering narrative. The agricultural and ecological impact of the Dust Bowl experience of the 1930s and the Great Depression of the 1930s-1940s affected the material production and consumption of pulp magazines and exerted a creative influence on writers (Ashley 75-8). During the early 1930s, construction on the Boulder Dam (renamed the Hoover Dam), the largest hydroelectric power plant in the world at the time, seemed to illustrate the potential benefits of an advanced technological America. Manning’s focus in “The Man Who Awoke” on arboreal over agricultural food production and the narrative’s contestation of technocracy in the narrative’s past offers to expose and critique the poor technological management of agricultural land and the failure of the technologised urban space. The impact of the Dust Bowl on North America and the worldwide effects of the Great Depression offer source material for an increased interest in terraforming that would have been timely, yet this is not borne out by an increased frequency of such stories. Perhaps the elements that make up such narratives in the 1950s and later in the 1980s-1990s were not yet in place by the 1930s and would need more time to coalesce in the wake of the dominance of space opera, in its heyday in the 1920s-early 1930s.

Although published in different magazines, Hamilton’s “The Earth-Brain,” Williamson’s “Born of the Sun,” and Manning’s “The Living Galaxy” are examples of what Mike Ashley calls “cosmic sf,” which he traces to Tremaine’s advocacy in Astounding of the “thought experiment” in 1933 (231). Ashley argues that the thought experiment variety of sf “took space opera to its better extremes, considering not just the exploration of space but the nature of time, space and the universe” (231). The connection between Stapledon’s use of cosmic scales to enlarge the scope of human perspectives and these proto-Gaian thought variants are suggestive of a critical element involved in imagining alternatives to conceptions of cosmological nature that prefigures the ecological speculation of post-1960s terraforming stories. Considering works by three significant shapers of space opera helps illustrate a shift in emphasis from the Burkean and Kantian sublime to sf’s technological sense of wonder, which feeds into the character of 1940s pulp treatments of terraforming.

This wonder toward technology is celebrated in John Russell Fearn’s “Earth’s Mausoleum” (Astounding 1935), one of the few terraforming narratives of the American 1930s pulp tradition. It uses terraforming to reflect on the negative social impact of introducing new technologies that offer humanity the ability to drastically modify their environments. Everett F. Bleiler notes that Fearn, although unpopular amongst American readers, was widely reprinted and translated for European markets (114). Fearn’s popularity is primarily due to his prodigious output of novels post-1940s, and as such many of his short stories before then are less well known. “Earth’s Mausoleum” has not been reprinted and as a consequence was restricted to an Astounding audience. Nevertheless, it is described in Bleiler’s Science-Fiction: The Gernsback Years (1998) and is catalogued on the Internet Speculative Fiction Database and tagged as a “terraform Moon” story, both of which are invaluable resources for archival research into 1920s-1930s pulp sf.

While terraforming and proto-Gaian themes co-occurred in Wells and Stapledon’s scientific romances, these 1930s short stories tended to feature one of these motifs to the exclusion of the other. Manning’s “The Living Galaxy” provides an exception that anticipates the link that would be forged between these two motifs in the 1980s. Ernest J. Yanarella argues for a connection...
between terraforming and Gaia when he claims that terraforming is the Jungian shadow of the Gaia hypothesis (225-88). Indeed, James Lovelock, the originator of the Gaia hypothesis, argues that terraforming Mars would be an “unremitting task of nurture and the daily guidance of the newborn planetary life until it could, by itself, sustain homeostasis,” thus implying that terraforming would fulfill the reproductive criteria of a Gaian planet seen as a living organism (189). He goes on to write that “[t]houghts of Gaia will always be linked with space exploration and Mars, for in a sense Mars was the birthplace of the theory” (189). In addition to the complex of images associated with space exploration that has been informed by sf, Lovelock refers here to his initial inspiration for the Gaia hypothesis, which he traces back to his work developing methods for detecting extraterrestrial life on Mars at NASA.

This paper then examines Murray Leinster’s proto-Gaian story “The Lonely Planet” (Thrilling Wonder Stories 1949), the terraforming narrative Fury (serialised in Astounding 1947) by Henry Kuttner and C.L. Moore, and Williamson’s Seetee Shock (serialised in Astounding 1949), all three of which have been widely reprinted. Living world narratives become less popular in the 1940s, perhaps because its radically fantastic premise proved incompatible with the increased emphasis on realism in sf, but the few that were published illustrate a continuing transformation of a motif that was prefigured by Manning in “The Living Galaxy.” Although Williamson had written stories featuring terraforming in the 1930s; it was in his 1942 short story “Collision Orbit” that he coined the verb “terraforming,” thus offering sf, and eventually scientific, philosophic and environmental discourse, a concept around which speculation and debate over the modification of planetary landscapes could cohere. This was the first published story of the CT series which, penned pseudonymously as by Will Stewart, marked a break from Williamson’s earlier, more fantastical work. John W. Campbell began to transform Astounding once again in 1939 with his innovative editorship and his encouragement to writers to devote more attention to realistic, logical and well written stories, thus ushering in what is popularly known as the “Golden Age” of sf. Williamson’s Seetee Shock is the first novel of the CT series, in which the deadly energy source seetee is mined from asteroids in deep space. Williamson’s coining of “terraforming” in this series established a space for the further development of the terraforming narrative; from 1942 they become more frequent and culminate in the first boom of terraforming stories in the 1950s. Sf at this time was responding to the effects of WWII and the bombing of Hiroshima and Nagasaki in 1945, evidenced by the dominance of nationalist future war stories and stories featuring atomic bombs which diverted attention away from terraforming. While the 1930s stories help establish avenues for treatments of the proto-Gaian, terraforming and geoengineering narrative before the onset of WWII, these 1940s works continue to use the living world and the terraforming motif to explore the potential benefits and problems involved in a willed rebuilding and transformation of society in the post-WWII context. Terraforming is still in its infancy, while proto-Gaian narratives such as “The Earth-Brain” employ supernatural themes alongside the sf icon of the sentient world, star or galaxy. These explorations prefigure many of the tropes that later terraforming works would develop in the context of global ecological crisis.

Williamson’s early work was heavily influenced by Abram Merritt, but his collaboration with Miles J. Breuer allowed him to develop a greater degree of realism in his writing. Their serial “The Birth of a New Republic” (Amazing Stories Quarterly 1931) influenced Robert A. Heinlein’s terraforming story “The Moon is a Harsh Mistress” (serialised in If 1965-1966). Williamson also credits Wells as an early influence of his and though he rates Stapledon highly, claims...
that he cannot "document his specific influence" (McCaffrey). The anticipations and re-workings of both terraforming and the related proto-Gaian theme in American pulp sf engage in and provide spaces for enviro-ethical reflection. While these re-workings have their root in the scientific romance, the spaces opened up by American pulp sf offer vectors for considering aspects of nature's otherness, or the relationship of otherness between the human and non-human. In sf, this relationship hinges on a feeling of Promethean fear, the sense that nature is overwhelmingly powerful and implacable when compared to humankind. The notion of a landscape, of the physical modification or the intellectual projection of cultural value onto nature, is a necessary human response to nature's otherness, and yet such acts of landscaping need not erase and so disrespect the recognition of nature's otherness. This paper draws on Simon Hailwood's discussion of nature's otherness and landscaping in How to Be a Green Liberal: Nature, Value and Liberal Philosophy (2004) and his essay "Landscape, Nature, and Neopragmatism" (2007). The concept of landscaping that Hailwood adapts is itself drawn from Holmes Rolston, III’s notion of landscaping.6

Proto-Gaian and Terraforming Stories of the 1930s

Hamilton’s “The Earth-Brain” describes the otherness encountered by explorers at the far regions of the Earth. Landon recounts to Morris (the frame narrator) his expedition to the Arctic, where he discovers a mountain that literally houses the Earth's brain. Despite the general dismissal of their sherpas' warning of a mythic prohibition on approaching the mountain, one of the expedition members entertains the possibility of its truth:

Why couldn't earth be a living organism instead of just a mass of inanimate matter? It seems an inanimate mass to us, it is true, but so must a human being seem an inanimate mass to the microbes that live on and in that being. Earth might be a living organism, all the planets might be organisms, of scale and nature so different from us that we mites who swarm upon it cannot even comprehend it. And if it is living it could possess consciousness and intelligence, perhaps intelligence operating on planes and for ends entirely alien to us. (Hamilton 144)

Both Lovelock and his collaborator Lynn Margulis employ the same analogies concerning the relationship between macrocosm and microcosm, between Earth's Gaian system and its constituent parts. Speculative questioning extends the living world and the scope of terra incognitae throughout the solar system. The assertion that the human cognitive faculty cannot encompass this larger system reinforces the feeling of asymmetry between humankind and nature by fuelling a sense of cosmic horror toward humanity’s uneven relationship to nature, itself a form of Promethean fear toward the cosmos. Important to this view is the notion that non-human nature is not inert matter that can be explained in mechanistic terms, but an organic creature in its own right. Nature’s status is disputed with this challenge to the rational-mechanistic landscape that Yanarella argues underlies later treatments of the Gaia hypothesis (250-51).

In contrast to a worldview that promises a coherent and complete understanding of nature, Morris emphasises humanity’s endemic lack of knowledge when he warns the reader that, "in your unbelief remember this – that of all things in the universe we men know least really of this earth we live upon" (Hamilton 137). The expedition discovers truth behind the myth when they encounter “a giant ovoid of light or force that towered there at the cone-
cavern’s centre” (Hamilton 157-58). This meeting echoes the confusion attendant on confronting the supernatural entity in M.P. Shiel’s The Purple Cloud (1901). It inspects and subdues the interlopers with “senses having nothing to do with any senses we knew but operating on planes entirely different”; Landon relates how “[t]he impact of that will was tangible, overwhelming. It seemed partly to replace, to usurp, my own will and mind” (Hamilton 160, 163). This subversion gives him a brief psychological connection with the alien intelligence, and through the resulting human/non-human duality of mind he is granted an awe-inspiring vision of the universe:

> My great body was racing at awful speed through vast leagues of infinite space! Far off across those immensities of space I was aware of other living earths, other planets, some larger and some smaller than I, but each living in the same vast way as I lived, each with its own great brain! (Hamilton 164-5)

Communication with a planetary alien intelligence appears (in this exclamation-studded passage) in embryonic form where contact involves an asymmetric non-human dominance of the channels of communication. As in The Purple Cloud, human consciousness approaches indistinguishability from the Earth-Brain, a breakdown of boundaries between the self and other that leads to a model of the transpersonal self in which the overcoming of one’s ego is inverted to become an undermining of that ego. This scene taps into the sense of cosmic horror through the image of a universe populated by unfathomable living planets, symbols of nature’s otherness on a cosmic scale that confound the expedition’s search for scientific knowledge. Nature’s otherness is a term from environmental philosophy that designates the relationship of otherness between the human and non-human. The discovery of the true nature of Earth raises to awareness the fundamental otherness of both terrestrial and cosmological nature. The explorers attempt to gain a measure of control over nature by temporarily occupying it through exploration and subsuming it under their scientific schema, thus annexing it to the human sphere and reducing its otherness to an identity.

The expedition’s ethnocentrism is challenged through a contrast of their worldview with “traditional” knowledge from other cultures, which undermines the stability of the expedition members’ understanding of the universe and results in a critique of their faith in reason and science. A critique of colonial tendencies informs this aspect of the text as the sherpas take on the role of representatives of a primitive society unclouded by faith in the comprehensiveness of scientific knowledge. This contrast implicitly extends the text’s scope to include other ideologies underpinning notions of Western civilization and progress. They are guides and harbingers of an ancient and dangerous knowledge, warning of “the forbidden mountain at the earth’s top-shunned by all our race!” (Hamilton 142). They are also ciphers whose role is to provide a foil for notions of a Western science allied to a dogmatic view of the non-human (Hamilton 142). When the Earth-Brain kills the other two members of the expedition Landon fires at it in self-defence. His action is described as a sin against nature, a transgression of the mythic prohibition spoken of by the sherpas:

> Colossal anger emanated from it at the same moment like a wave of destroying force, and as that cosmic wrath swept through me I knew that I had committed blackest sin against the universe in daring to attack the brain of the living earth-body upon which dwelt I and all my tiny race! (Hamilton 170)
It exacts retribution for Landon’s violence, which itself is a reaction against the asymmetrical relationship between cosmological nature and humankind, by pursuing him across the planet with earthquakes. This plot development suggests the theme of humanity’s regulation as part of a system and assigns this responsibility to the Earth. The living planet operates in this capacity as a check to human domination, with tremors operating as a sublime symbol of Earth’s retribution. Morris implies as much when he warns that “we who consider ourselves masters of all are not but a race of microscopic parasites dwelling upon the vast and strangely living body of that Earth—Brain” (Hamilton 181).

“Born of the Sun” marks a negotiation of the boundary between cosmic horror and the sf technological sublime. Earth and the other planetary bodies are eggs, their parent the sun, which “expands and contracts in the rhythm of the sun-spot cycle, with a beat like the pulse of a living thing” (“Born” 16). Descriptions of the Moon’s hatching, which prefigures Earth’s fate, relate dread and majesty when characterising the living world as “more than anything else like the eldritch, gorgeous streamers of the Sun’s corona” (“Born” 25), thus tapping into the language of weird fiction through an adjunct used frequently by Lovecraft: “eldritch”, meaning “[w]eird, ghostly, unnatural, frightful, hideous” (“Eldritch”, Online OED). Further description of “[a] body, both horrible and beautiful” and reference to “[t]he shadows it cast, inky-black, green-fringed, were uncanny – dreadful,” show an ambivalence that accompanies revelation of nature’s alien otherness and subverts dominant understandings of Earth (“Born” 25). Williamson connects the sublimity of the living world to beauty, two concepts that Burke considers separately as centring respectively on pain and pleasure. Beauty for Burke is a social quality that attracts humanity into an engagement with the other. Unlike the sublime it is founded on the submission of the object to the subject: “we submit to what we admire, but we love what submits to us; in one case we are forced, in the other we are flattered into compliance” (Burke 147). This tension between the sublime and beauty is an important cognitive structure that forms one of the axis by which sf examines the human relationship to the non-human. Ultimately, it suggests that beauty as an aesthetic response to nature is complicit in domination of nature’s otherness and cannot offer aesthetic grounds for ecologically sound relationships to the non-human.

Barron Kane is another explorer figure who discovers and brings knowledge of the Earth’s nature to his nephew Foster, an inventor figure and the protagonist of the story. Kane has infiltrated a mysterious Sect where he discovers “that oriental insight had seen the truth hidden from our dogmatic western minds,” thus echoing Hamilton’s use of sherpas as homogenised foils for Western (rational scientific) landscapes (“Born” 16). Against the sect’s fatalistic belief that all humanity should die in Earth’s catastrophic birth Foster and his Uncle, accompanied by Foster’s fiancée June and a selection of colonists, hasten to construct a functioning spaceship to escape Earth’s destruction. Social responses to the catastrophe are subordinated to Foster as heroic individual. Viewing the Moon’s destruction, Foster and June affirm the importance of the smallest unit of community as a response to individual insignificance: “It was lovely – and horrible – …Our world must go – that way, dear – ’ he breathed; and her shivery tiny whisper finished: ‘But we have – each other –’” (“Born” 25).

Community is conveyed by romantic cliche, but Foster’s status and the masculinist heroism of the text emphasises his individualism and hubris. He is elevated from the group in a version of the transpersonal self when, “[i]n a moment of crystal vision, he saw himself not as one man fighting for his own life, but the champion of humanity, battling for ultimate survival” (“Born” 20).
Barron Kane supports Foster’s vision when he says “[i]t’s up to you, now, to save the seed of mankind,” and he evokes the Adam and Eve myth also utilised in The Purple Cloud but transplants it to the geography of space: “[t]he children of Foster and June will conquer space, to the farthest one of you!” (“Born” 38). The obligation to remain independent of the planets is incompatible with this colonial urge to conquer space. Foster’s attempts to combat both nature and the mobs incited by the sect enact the struggle between submitting to and forcing the other, both natural and cultural, into submission.

Invention gives humanity a way to free themselves from their dependency on nature. The spaceship, christened the Planet, “can sail on forever, Barron. It’s a little world, itself, independent of the Sun” (“Born” 22). The insect metaphor is revisited in conjunction with this theme when Foster realises that, because of his anti-gravity invention, “Men will now be small parasites no longer, to be crushed like vermin by any chance tremor of the beast that bears them” (“Born” 38). The machine grants an affective response opposed to the helpless awe they experience when seeing the moon crack, “[a] kind of lofty elation” and “a sense of triumphant power that lifted him far above any human concern” (“Born” 33). This allows Foster to transcend his ego and attain “the supreme tranquility of a god […] It was sublime, awful Nirvana. He had forgotten even June” (“Born” 33). This alternative to cosmic horror means that humankind can now begin to occupy a position of dominance in relation to nature. Foster’s recognition of humanity’s dependence on the planets, each with an autonomous existence independent of humankind, implies a moral dimension suggestive of obligation toward and an opportunity to achieve hyperseparation from nature: “[y]ou’re alive, all of you. We owe our lives to you – we’ve been parasites on your kind. But we aren’t any longer. We’re beginning all over again, on our own” (“Born” 38).

Meeting this obligation coincides with the promise of a new, utopian society represented by the crew of the Planet, “[s]ix hundred picked men, representing every race and every craft and every creed, with their wives and children. Two thousand all told – and the very cream of humanity” (“Born” 22). There are problems with this basis for a new humanity which is especially evident when contrasted to the orientalised Eastern sect opposing them, members of which are described as “yellow-visaged demons armed with the weapons of a secret science” (“Born” 28). The sentence’s syntax also invests only the six hundred men, not their wives (the only women aboard) with representative power for humanity’s cultural diversity. The selection process, however, is suspiciously elided. The sect’s manipulation of human fears during the tremors presaging Earth’s traumatic cracking allow them to muster an army to confront and kill the colonists; their death again elevates Foster and June’s personal relationship to a place of prime importance.

Laurence Manning’s “The Living Galaxy” prefigures Stapledon’s extension of the living world trope to galactic scales, suggesting a series of macrocosmic levels for the colonial extension of Earthbound life throughout cosmological nature. The central story is narrated as a history lesson for a child of the far future and relates with some uncertainty an explorer’s encounter with a potentially living galaxy, along with contextualising information about a now ancient and mysterious Earth. An initial frame narrator contemporaneous with the implied reader begins with an apology and a request: “[i]t is impossible for me, as author, to write their story so that it is complete in itself; I must ask you, as reader, to lend a hand to the work” (“Living” 437). This device calls on an implied reader to imaginatively assume the identity of a child at a history lesson in the far future while engaging a critical stance toward the events related during the second frame narrative of the history lesson. The narrative’s
Terraforming and Proto-Gaian Narratives

discussion of colonial expansion throughout the galaxy, anticipated with wonder by Foster in “Born of the Sun,” is destabilised by Manning’s positioning of this second frame in the far future and contributes to the irony directed toward notions of technological progress.

Manning’s awareness of ecology, demonstrated a year earlier in “The Man Who Awoke,” is directed in this story toward principles central to the technical aspects of terraforming. The narrator of “The Living Galaxy” notes that Earth “possessed by nature a climate and an atmosphere suitable to human existence without any artificial aide” and “was deserted by thousands of explorers who settled down on the five remaining planets of the solar system. These were not habitable without artificial air and heat” (“Living” 438). Manning’s interest in planetary environments and his knowledge of ecological issues stems from his interest in space colonisation and his involvement in pioneering early space rocketry. He was, along with fellow sf writers G. Edward Pendray, David Lasser, and others, one of the founding members of the American Interplanetary Society, which changed its name to the American Rocket Society and merged, in 1963, with the American Institute of Aeronautics and Astronautics (AIAA). As the editor of the American Interplanetary Society’s journal Astronautics, Manning was well informed with regard to the technical aspects of spaceflight and the maintenance of contained environments. In the mid-1940s Manning retired from the organisation, an event that marks a shift toward the professionalisation and legitimisation of rocket science as a field for scientific and technical enquiry. Manning also wrote a book, The How and Why of Better Gardening (1951), from which could be inferred a link between space flight and garden landscapes. In “The Living Galaxy” early terraforming themes are connected to the colonisation of space which, as in Williamson’s text, is reliant upon technology for realisation. Colonisation is seen as a case of “steady, peaceful expansion” made possible by “two great inventions” and cosmological geography: the release of atomic power and atomic synthesis (anticipating Williamson’s CT Stories), and the abundant space and resources available throughout the galaxy (“Living” 438). This latter idea alludes to histories of the colonial acquisition of resources and territories, a relation that is strengthened by the pedagogic narrative frame. However, the initial narrative device, by highlighting its textuality and the uncertainty of the fictional historical events, engages the implied reader in an ironic unmasking of the official story, thus calling into question notions of colonial expansion.

Bzonn’s encounter with what he believes is “a gigantic creature rooting dangerously with a tentacle among the stars that housed the human race” shows that, despite this ideology of peaceful expansion, a meeting with nature’s alien otherness provokes a violent reaction (“Living” 442). The narrator, whose authority is already compromised by his temporal distance from these events, asserts that “[i]t must be borne in mind that Bzonn felt no doubt that the star-mass composed a living intelligent creature” (“Living” 442). The teacher’s professional scepticism leads him to consider various opposing theories but the structure of the narrative manipulates the reader into support for Bzonn’s theory that “the protuberance was a creature of life in some form which utilized solar systems after the fashion of atoms” (“Living” 441). Bzonn’s destruction of the galaxy in perceived self-defence means that certainty can never be attained, much to the implied detriment of humanity. The story’s “Afterword” sees the return of the initial frame narrator but is narrated in second person, toward an implied reader who retains their imaginative assumption of the schoolchild’s identity. This final device works to construct a complex set of relations between colonial expansion and the curiosity and wonder of a child toward grand historical events that are untainted by a subtext that is critical of this
expansionist ideology. In addition, the narrator conflates the supposed ideological position of the implied reader and this member of the far future when describing how “[y]ou are one of those who cannot wait for the next day to bring what it will – you must peer into the next chapter, driven by curiosity. For long hours you sit there over the book and I would give anything to know what you read there!” (‘Living’ 497) The frame narrator, implied reader and child of the far future all have a stake in the knowledge and wonder of the future, and yet this intergalactic imperialism is undercut, thus placing this story in opposition to the faith in technology evident in Williamson’s “Born of the Sun.”

This discussion highlights an asymmetry between humankind and non-human nature in these proto-Gaian narratives that Yanarella identifies as a “profound indifference” toward the fate of individual species, a characteristic that he sees as implicit in the Gaia hypothesis (227). In his essay “Supernatural Horror in Literature,” Lovecraft describes the fear of the unknown as productive of cosmic horror, an experience that, like Promethean fear, fundamentally encodes an awareness of the asymmetrical relationship between the human and non-human. Lovecraft’s contributions to Weird Tales, in stories such as “The Dreams in the Witch House” (1933) and “At the Mountains of Madness” (originally written in 1931 but rejected by Weird Tales and published in Astounding in 1936), and his short story “The Colour Out of Space” (Amazing Stories 1927), all present cosmic horror in relation to aspects of a previously unsuspected cosmological nature. The echoes of Shiel’s text in Hamilton’s treatment of the living world and the use of cosmic horror further support the case for the dialogic exploration of proto-Gaian themes in early pulp sf. Proto-Gaian themes are connected to journeys of discovery, a structure that opposes known and unknown spaces as an emblem for scientific discovery, which is itself often presented as a method of negating nature’s otherness. Williamson’s text offers the technological sublime as a counter to the sense of human insignificance in the face of a sublime cosmos, whereas the discovery of the proto-Gaian entity in other stories challenges the capacity for scientific enquiry and colonial projects of acquisition and mastery to erase nature’s otherness. It is this sense of technological wonder, joined to an enquiry over society’s capacity to transform themselves by transcending their limitations, that feeds into later terraforming narratives.

In Fearn’s terraforming story “Earth’s Mausoleum,” a spaceship proves to be the original impactor that separated the Moon from the Earth. This narrative echoes Williamson’s “Born of the Sun” by centring on the emergence of the alien from within the Moon. Unlike the living world in Williamson’s story, these alien visitors are able to communicate with humankind and freely share their technology and expertise with them, which eventually leads to their directorship of the grand project of terraforming the Moon. Like the cult’s response to Foster’s technological answer to the Earth’s destruction in “Born of the Sun,” new forms of advanced technology affect the gradual amelioration of the colonists’ involvement in determining the shape of the future society on the Moon. This lack of direct involvement in working to shape their future society on the Moon leads to widespread disaffection amongst the colonists and provides the conditions that allow a group of saboteurs to compromise the terraforming effort by accidentally initiating the process of the Earth’s destruction via the extinguishment of the Sun.

Many of the themes in “Earth’s Mausoleum” became staples of the terraforming narrative and, together with those developed by living world stories, prefigure many aspects of these later works. Crespin, a scientist who makes first contact with Mayro and the other aliens and who eventually becomes Mayro’s appointed successor, sees the terraforming of the Moon as an
extension of geoengineering, an act of conquest to “extend Earth’s ramifications” (Fearn 71). Mayro directs a “One Year-Plan” to open up Earth’s environments and resources for human use, “the vast improvement in the constructional scheme of the world,” which eventually leads to the desire to “cultivate a perfect little world” on the Moon (Fearn 72). Terraforming involves the construction of massive atmosphere generators and much human labour, leading another scientist (Konsicks) to think that they are dealing in things too big for them, “beating nature at her own game, so to speak” (Fearn 75-6). As the iconic image of a “softly green “new” Earth visible from the sky” of humankind’s first planet takes shape, the second phase of terraforming begins as the tough community of pioneers level mountain ranges and crater walls to shape the Moon’s topology (Fearn 84). Mayro’s discovery of a method for liberating atomic force and the invention of a powerful “dredger” triggers growing social unrest as the once happily busy colonists are deprived of fulfilment in hard work. Capitalising on this disaffection, an oppositional minority sabotage the dredger out of malice toward the aliens but fail to appreciate fully how it operates and accidentally begin to siphon energy from the Sun. In order to avert disaster, dreams of a utopian new Earth are abandoned when the Moon is converted into a new sun. Mayro and the surviving aliens, well-meaning scientists who fail to understand the impact of introducing new technology to human society, sacrifice themselves and their ship so as to ensure that humankind survives the catastrophe.

“Earth’s Mausoleum” explores the social repercussions that the introduction of new technology brings to society. The complex of technologies for adapting Earth and the Moon usher in a utopian time as humankind engages heartily with this period of reconstruction. However, the accelerated pace of technological change ultimately alienates them as they discover that their engagement in shaping their history, symbolised by their concerted terraforming effort, is superseded by technologies that they cannot understand and that leaves them unable to situate themselves in respect to the determination of their futures. Unlike Williamson’s “Born of the Sun,” new forms of technology do not offer humanity a second chance to develop new relationships to nature. Earth’s societies are instead dispossessed by the unprecedented pace of change inaugurated by the aliens’ introduction to humanity of new technologies. Furthermore, nature in this story is seen solely as a background for the development of a utopian society. The terraforming motif is not used to engage speculation regarding the appropriate human relationship to nature. Rather, terraforming technologies offer humanity the ability to gain a level of mastery over nature, which allows them to overcome their limitations with regard to their asymmetric relationship to cosmological nature.

Proto-Gaian and Terraforming Stories of the 1940s
Terraforming and proto-Gaian narratives of the 1940s pulp tradition continued to develop many of the themes first raised in scientific romance and transformed by the American pulp sf of the 1930s. There were fewer proto-Gaian narratives during the period in which the post-WWII terraforming boom that would take shape in the 1950s was developing. In Murray Leinster’s “The Plants” (Astounding 1946), interplanetary explorers encounter a world covered by a single species of flower that works in concert to telepathically subdue aggressive intruders by rendering them unconscious. This premise prefigures Lovelock’s Daisyworld, a computer simulation that models a simple homeostatic system on a planet populated by light and dark shades of daisy. The cyclical dominance of one shade of daisy over another governs the variation in albedo of the planet, thus highlighting the regulatory function of life on a planet’s climatology. This feedback mechanism between organisms and their environment is not a feature
of the narrative of "The Plants," however. Leinster's "The Lonely Planet" tells of the sentient living world Alyx, whose consciousness emerges through its relationship of otherness to human colonists. This story deals with the ensuing paranoid reaction and aggression directed toward the living planet when it makes its intelligence known.

In “The Lonely Planet,” the living world is set against an interplanetary background, geography already touched on in Stapledon’s work and earlier cosmic sf. Through an alien planetary consciousness, Leinster continues his exploration of human-alien contact famously handled in his short story “First Contact” (Astounding 1945). The world in this story is represented, not as a creature living in the planet’s core, but as one covering its surface. Alyx is a single living organism that develops consciousness after a long period of subjection to humanity’s instrumentalist approach to cosmological nature. At first its compliance to men’s wishes make it “a living, self-supporting robot, an abject servant to any creature with purpose it encounters,” which leads to its exploitation for the labour to mine the valuable rotenite in its own crust (“Lonely” 83).

Alyx is perceived as threatening when its superlative scientific and technological progress is discovered to have outstripped humanity’s. The Alyx corporation’s economic interest in the planet leads them to the view that “[t]he idea of a greater-than-human intelligence [... is] frightening. If it became known, the results would be deplorable” (“Lonely” 85). They decide that “Alyx had to be killed” because “[i]t was wiser than men. It could do things men could not do. To be sure, it had served mankind for five hundred years” (“Lonely” 90). Alyx is capable of developing technology incomprehensible to humanity, but their fear leads them to reject opportunities to learn from it. It offers to create a utopia for humanity on its surface yet, except for a few descended from the explorer who originally identified Alyx as sentient, it is refused. Recalling the orientalised cults in Williamson’s “Born of the Sun,” the narrator records how “[c]ults, too, sprang up to point out severally that Alyx was the soul-mother of the universe and must be worshiped; that it was the incarnation of the spirit of evil and must be defied; that it was the predestined destroyer of mankind and must not be resisted” (“Lonely” 94). These responses are indicative of attempts to explain in religious terms threatening cosmic events, thus connecting the societal confusion caused by a confrontation with nature’s otherness to the dialogic aspect of sf, here represented as a thematic element of the text. Several groups adhering to diverging positions attempt to speak for Alyx, thus demonstrating attempts to incorporate the living planet into humankind’s intellectual landscapes and thus downplay its radical alien otherness.

The theme of a “war against nature” appears in Kuttner and Moore’s Fury and Williamson’s Seetee Shock. Various spaces in each text continue the dialogue on the human relationship to nature, allowing them to comment on the political and social aspects of terraforming. Kuttner and Moore’s Fury offers an ambiguous ethical critique of an individual’s desire to conquer other people and new spaces, suggesting that human progress relies on defiant individuals to transgress physical and ethical limits. Williamson published a series of short stories and novels throughout the 1940s dealing with the economic and political opportunities that free and unlimited sources of energy offered to society for the realisation of a utopian future. The ability to harness the energy of “contraterrene matter,” or seetee (what would now be recognised as dark matter), provided the text another foci for developing ideas of mastering nature, reiterated and adapted within the context of an interplanetary society with competing nationalist and corporate interests loosely governed by the political centre, Earth.
In Kuttner and Moore's *Fury*, Sam Reed represents a ruthless will to overcome the human limitations imposed by the brevity of life in contrast to the elite known as "Immortals," and the rigidity and stagnation of social institutions in the undersea cities of Venus. Groff Conklin writes that "[t]he inward psychological warfare between his [Reed's] own belief in his short-livedness and his inborn, unconscious sense of the "long view" which typifies all Immortals, is the core around which his own career, and the salvation of mankind, develops" (Kuttner 7). This tension between short-lived humanity and the Immortals, to which Reed unknowingly belongs, introduces a doubling of perspective that recapitulates the Stapledonian theme of the "long view" central to many terraforming texts. Extending human life beyond its standard limits generates a perspectivising shift, a strategy that resonates with Nicol Jenkins’ consciousness of "a vaster view" in *Seetee Shock* (85). Narratives that encompass several standard human lifespans re-occur in the terraforming tradition and enable these texts to reflect on the long-term physical, socio-economic and politico-cultural transformations that adapting planets entail.8 The early terraforming of Venus’ surface in *Fury* is characterised as a struggle against "an antagonist no man had ever known. [...] He faced fury... And he fled" (Kuttner 8). In contrast, "[t]ime had slowed [in the undersea cities]. In the beginning it had moved much faster. There was much to be done. Venus was uninhabitable – but men had to live on Venus" (Kuttner 8). Time is encoded in terms of the experienced pace of material and social development. The undersea domes limit expansion, resulting in decelerating development, cultural decline and stagnation.

Reflecting on human fragility, the narrator states that "[m]an is both tough and fragile. How fragile will be understood when a volcano erupts or the earth shakes. How tough will be understood when you know that colonies existed for as long as two months on the Venusian continents" (Kuttner 8). This observation is based on two different perspectives toward human fragility. In the context of natural events, humanity is indeed fragile. However, when humanity exerts agency over the physical world, they demonstrate material and psychological resources that allow them to cope with threatening environments. This passage underscores humanity’s fundamental fragility in comparison to nature’s violence in the Venusian jungles. The colonists’ response to the dangers of the jungle is to homogenise that nature before exterminating it: "[a]nything under a foot long was classified as a bug. That left the fauna – critters – and the flora – the green stuff" (Kuttner 151). One creature in particular, the "siren web" operates as a metonym for nature’s otherness and a vector for the sublime (Kuttner 156). It hypnotises its observers, making it “impossible ... to see what the siren web really was, for again [Reed] experienced that stasis of the senses and could only gaze with painful delight at the motion of its colours" (Kuttner 157). Reed observes a juggernaut, a "metal destroyer" clearing the forest, and "for a moment it seemed impossible that even a creature of steel and impervium could withstand the onslaught of that wonderful hypnosis" (Kuttner 157). In an act of destruction that symbolises a disrespect of nature’s otherness underlying the drive to terraform, the siren web is trampled: “the thing that slid groundward was an enchanted web, a Nessus-shirt of burning colour. But the thing the caterpillar treads crushed into the green melee beneath them was an ugly, rubbery grey mat that squirmed convulsively when the cleats caught it” (Kuttner 158). This disrespect is grounded on an aesthetic insensitivity that stands as an indicator of the human mistreatment of alien nature. Terraforming is a violence that destroys nature’s integrity, in this case erasing its otherness and its sublime enchantment. Reed’s drive to dominate social and political worlds finds an analogue in his domination of nature.

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8 The early terraforming of Venus’ surface in *Fury*
Hale, Reed’s partner in the terraforming campaign, orchestrates this spectacle of destruction for Reed’s gaze. Reed’s failure to respond to the hypnotic effect of the siren web “proved anew that he was no fit subject for hypnosis of any kind” (Kuttner 158). Yet it reappears, transformed into an ornament in Reed’s office, contained and objectified yet still possessing a hypnotic power that does captivate him (Kuttner 182-3). The destruction of the hypnotic siren web and its containment is an emblem for all that is threatened when terraforming is conducted without respect for the needs and interests of nature. Reed is only able to appreciate the siren web’s affect in a form diminished enough for him to exercise dominance and control over it, shearing it of its autonomy and its sublimity. Although terraforming is conducted in terms of a furious war against nature, it is not Promethean fear that drives Reed’s efforts to overcome humanity’s asymmetry to nature, but the desire to satisfy one’s own interests at the expense of the autonomy of others.

Seetee is a prized resource harvested by the spatial engineers from the seetee drift in deep space, an environment that is metonymic for Promethean fear; space is feared because of the dangers of the “atomic”-style radiative properties of contraterrene matter and the “Fury!” of its potentially unlimited capacity to generate overwhelming quantities of energy (Seetee Shock). In Seetee Shock, insanity is a distinct occupational hazard for those working the drift; Nicol Jenkins begins to attribute a voice to this spatial vector for nature’s otherness, imagining it to be taunting him by drawing attention to his asymmetric relationship to cosmological nature: “‘[y]ou men weren’t shaped for space,’ that thin hissing mocked him. ‘Your feeble senses and your fragile, watery bodies were designed for a kinder environment. Your invasion here is folly, and you’ll win no prize from the drift but death’” (Seetee Shock). Human bodily fragility, shaped by evolutionary processes within the confines of a planetary environment, grounds this anxiety toward deep space; concomitantly, Earth and other similar planets are affirmed as the proper space for humankind. The seetee motif compounds this vector for consideration of nature’s otherness: seetee, or “contra-terrene” matter, creates unstable reactions when it is brought into contact with terrene matter. Both of these substances constitute the familiar (though still natural otherness) of this textual universe. Only through careful technological intervention can the two forms of matter be brought into contact, thus releasing deadly radiation that is harnessed as an energy source. As a vector for nature’s otherness and a source of Promethean fear, it is both hyperseparated from the human domain and instrumentalised. The utopian element of this text, the dream of free energy that would allow humanity to “manufacture air and soil and water, to cloak in green life all the riven stone of a world born dead,” (Seetee Shock) involves landscaping seetee as a wild beast, and its environment as a space that can be “tamed” (Seetee Shock).

This dream of free energy involves another related instance of disrespecting nature’s otherness. Free energy makes terraforming the solar system possible. In one episode Jenkins and his love interest Jean Hardin view the spectacle of the sunrise over Tor, where “dead, tremendous summits burst out of seas of night into harsh reality as the probing light found them” (Seetee Shock). These terraformed summits are “magnificent” only in the context of the city’s “[g]olden roofs and walls of purple glass,” pools and terrestrial plants, and thus represent an instance of incorporation, in which nature’s value is derived wholly from human landscapes and thus gain their significance only in relation to humanity (Seetee Shock). Jenkins is unable to appreciate this landscape’s aesthetic value, not only because his terminal radiation poisoning preoccupies him, but also because of his adoption of “a vaster view”; his dream of terraforming all the planets and asteroids of the solar system (Seetee Shock)
The appearance of vegetative nature is clearly a landscape imposed upon an alien environment, which is backgrounded and instrumentalised. As Jenkins thinks, “[t]hey were all predators, come to loot the asteroids for their planets or their corporations or their own private pockets” (*Seetee Shock* 79). Expansion throughout space is made possible by converting nature’s cosmological otherness (emblematised by *seetee*) into resources that facilitate terraforming.

Disrespect of nature’s otherness is mirrored by an exploitative attitude toward society. Isolated in the deep drift, Jenkins’ projection of a voice onto this instance of cosmological nature offers a threatening because critical examination of the human relationship to nature and to each other at large: “[h]ow can you stop history from repeating the same ugly story with the greater power of *seetee*” (*Seetee Shock* 14)? The drift admonishes Jenkins to “Remember Hiroshima! [...] Remember World War III and then the Spatial War,” (*Seetee Shock* 13) while Jenkins later reflects that “[w]ith all the planets almost at war over the vanishing reserves of uranium and thorium, the contraterrene technology might seem an imperial prize” (*Seetee Shock* 25). *Seetee Shock* exemplifies a wider shift of perspective in these post-WWII terraforming and proto-Gaian stories that revolves around a troubled reflection on issues of power. In contrast to the opportunist use of technology for the purposes of political and social supremacy, Jenkins affirms that he is “more interested in the peace-time uses of *seetee*” (*Seetee Shock* 26). Like Fearn’s “Earth’s Mausoleum,” *Seetee Shock* reflects on the social impact of technology, but it re-situates this classic enquiry into the social use and effect of science and technology against the background of the post-WWII context.

These works offer textual sites for reflection on the problem of imagining a utopian transformation of society in the light of a colonial anthropomorphism that leads to a conquest of nature. Nature’s otherness, a concept designating the relationship of non-human nature to the human, is conceived of in cosmological terms in the scientific romances and early cosmic pulp sf of the 1930s-1940s. Promethean fear, grounded in the axiomatic asymmetry between humankind and nature, is evident in the cosmic sf of the 1930s and the proto-Gaian and terraforming stories of the 1940s. Such responses are imagined as leading toward an urge to direct humankind’s environments and history via technocratic societal management, as in “Earth’s Mausoleum,” or through various technological fixes such as the contained spaceship/habitat in “Born of the Sun.” When the asymmetry between humankind and nature is undermined in cosmic sf, Promethean fear is overturned and technology appears to elevate humanity above nature, allowing them to exploit and control the cosmos. Manning’s “The Living Galaxy” ironises this development. They deploy terraforming and proto-Gaian themes to explore in various ways civilisation’s disrespect of nature’s otherness and the relationship between science, society and the environment and thus prefigure the shape of the terraforming narratives of later years.

Terraforming as a scientific and technological endeavour is a form of landscaping, which encompasses both physical modifications of the environment and intellectual projections of culture onto nature. As a process that involves hybridising culture and nature, it offers avenues for coping with the asymmetry of human relationships to nature by imposing anthropocentric needs and interests onto nature’s otherness as a precursor for narrowly instrumental relationships. Representation of the human response to the multiple natural environments and to instances of alien life provide vectors for considering how landscaping as a response to the environment incorporates nature into the human domain. The physical fragility of the natural environment is complemented by an awareness of the fragility of individuals and civilisation, but this is also paralleled by an intellectual fragility that makes it difficult to
maintain a respect for nature's otherness. Disrespect of nature's otherness often involves a parallel disrespect of human otherness, illustrative of a structural homology whose root can be found in the attitudes of the agent of terraforming toward the landscapes of others and toward nature's otherness.
Notes

1. Kuttner, p. 27.


3. Throughout this paper dates in parentheses following the title of a work refers to the original publication date of the text.


7. See The Ages of Gaia for more information on the Daisy World model.


Works Cited


Terraforming and Proto-Gaian Narratives


