PyroGaia
— Planetary Fire as Force and Signification

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> What if I am, in some way, only a sophisticated fire that has acquired the ability to regulate its rate of combustion and to hoard its fuel in order to see and walk? (Eiseley, *Star Thrower*, 151).

For critical thinkers the foremost challenge of climate change and the Anthropocene may turn out to be not so much finding a section of humanity to hold culpable for environmental catastrophe or discovering a way to reduce earth history to a manifestation of social history as it is learning to think *with and through* the earth. While it is of course vital to ask what 'we', as a class-divided collectivity, a civilization, or a cohort have made of our planet, it now seems at least as important to inquire how and from where social actors acquired the force to shift the earth into a new trajectory. Or to put it another way, to ask what kind of planet is this that births a beast such as us.

In the haste to capture the Anthropocene thesis, to subdivide and extract from it familiar categories of social agency, it is easy to overlook that there are ways of transforming the stuff of the earth that bind us together as a species, a genus, an earthly being. The ability to manipulate fire is not only shared by every extant human community, it also weaves us into the tangle of other hominid species—the throng of antecedents and relatives who ensured that the genus *Homo* was a multiplicity for the vast majority of its more than two million year tenure on the earth.

Fire wielding did not directly lead to climate change: evolution doesn't do linear paths. But it is certainly a *condition* of the modes of combustion that are currently transforming the earth system. If this ought to foreground the role of fire in the human story, so too should it prompt us to ask about the part played by fire in the earth's own history.

Researchers and theorists who grapple with fire have a tendency to shun the consolations of anthropocentrism for more elemental angles on earthly existence. As in the case of anthropologist Loren Eiseley, whose epigraph opens this paper, thinking fire through its human uses often segues into thinking the human through fire. In advance of the Anthropocene thesis, environmental historian Stephen Pyne—today's leading proponent of pyro-centric thinking—had already constructed a coherent planetary vision that fused the earth's inflammatory tendencies with the fire-enabled agency of our own species.

This is the only astronomical body in the solar system on which fire is present, Pyne likes to remind us, and we humans are the only life form on this planet that routinely handles fire. But with the emergence of this fire manipulating creature, he provocatively adds, '*the Earth did not get quite what it supposed'* (*Fire*, 26).

Fire flares brightly in Anthropocene discourse—the discussions around the possible arrival of a novel geological epoch and the associated debates about when, how, and to what extent humankind should be construed as a geologic agent. Those in favour of a longer Anthropocene argue that our species was already transforming the face of the earth with fire deep in our Pleistocene prehistory, while proponents of a more recent Anthropocene put a lot of weight on the impact of industrial combustion of fossil hydrocarbons on the earth system (see Clark, 'Fiery Arts').

If a key to Anthropocene science is a new understanding of how different components of the earth system are integrated or 'coupled', then here too, fire features prominently. Atmospheric chemist and premier Anthropocene exponent Paul Crutzen has a background in researching the role of biomass burning in the shifting composition of the earth's atmosphere. Far from simply denouncing anthropogenic burning of forest and grassland, Crutzen was an early advocate of the idea that skilful use of fire as a form of ecological management can play a part in the removal and sequestration of excessive atmospheric carbon (see Crutzen and Andreae, 'Biomass Burning') As he concluded, a few years prior to his canonical announcement of the coming of the Anthropocene ('Geology'), 'the preservation and study of fire will assist humanity in its larger stewardship of the Earth' (see Goldammer and Crutzen, 'Fire', 11).

As well as framing fire as a vital connection between the dynamics of the biosphere and atmosphere, Crutzen's early attempts to quantify the atmospheric effects of human biomass burning can also be seen as a significant contribution to the scientific representation of dynamical processes at the planetary scale: a version of what we might now refer to as geomediation. At the same time, it is the monitoring and modelling of the climatic effects of fossil fuel combustion that has been at the core of the most extensive collaboration of scientific researchers ever attempted.

With its unthinkably complex simulations of the impact of carbon dioxide and other greenhouse gas on the earth system, climate science has taken geomediation to unprecedented levels: its amassed and shared data clouds mirroring the vaporous accumulation of greenhouse gases in the global atmosphere. Indeed, the very logic of the general circulation models that are central climate research is that they should be able to *project* climate: more than simply *representing* existing climatic conditions, they are intended to *perform* the emergence of novel patterns from the interaction of the component parts of the earth system.

What does it mean for the compound term geomediation that in order to capture some aspect of the complexity of the earth system, our models must themselves actualise something of very processuality of that system? We might come at this question from another angle, by way of Pyne's evocation of an earth not quite getting *what it supposed*, a formulation that echoes Gilles Deleuze and Felix Guattari's earlier exclamation 'who does the earth think it is?" (*Thousand Plateaus*, Ch. 3). Or perhaps sidling toward planetarity along less-travelled paths, we could follow social theorist Vick Kirby's more Derridainspired appraisal of ‘a very real possibility that the body of the world is articulate and uncannily thoughtful’ (*Telling Flesh*, 5).

The provocation that seems to be shared by the otherwise disparate of oeuvres of Deleuze and Guattari, Pyne, and Kirby is that human efforts at geomediation are not so much alien adjuncts to an insensate astronomical body as they are faculties that are, in some vital way, continuous with cognitive or communicative capacities proper to the planet itself.

No longer as incongruous with media theory as it may have been prior to the ascent of climate change and Anthropocene thematics, the idea of an originary self-mediating earth system has begun to reverberate in critical engagements with the more familiarly human ‘informationalizing’ of planetary processes. In Benjamin Bratton’s diagramming of the structural layering of contemporary informational systems, he makes it clear that ‘computational infrastructures at the Earth layer extend the planet's capacities to sense and monitor its own energy usage’ (*Stack,* 127), while Sean Cubitt insists that ‘everything that mediates is a medium—light, molecules, energy’ (*Finite Media*, 4).

Fire, too, I want to argue, is a medium—a signifying process as well as a force—and one that is, from its very inception, planetary in scale. If this is indeed a fire planet, then what role does fire play in the earth’s own geomediation? Bouncing off the Gaia hypothesis—the idea that life plays a key role in the earth’s self regulation—I move from the issue of human combustion impacting on earth processes to the question of systemic shifts brought about by the dynamics of the earth itself. If ‘Gaia’ is characterised both by remarkable resilience *and* a capacity for momentous transformations—to what extent is this bound up with the planet’s own faculties for self-sensing or intelligibility?

While its has often been noted that human agents experiment or play with fire, I ask, does Gaia experiment with its own flammability? And if there are planetary trials of fire or wagers on combustion, do they always pay off? Finally, I turn to the question of what it means to be the spawn of a fire planet—or what I term PyroGaia— when it comes to our own 'pyropolitical' decisions about what flames to extinguish and which fires to protect or proliferate.

Global Fire and Geomediation

The ways in which global fire is represented, I have been suggesting, have been undergoing significant development. If in some regards, socio-technical media still struggle to express the properties, dynamics and consequence of combustion, in another sense fire is far too easy to depict. Fire—itself humankind's most ancient medium for advancing visibility into darkness—seems to have an affinity with the flickering of light characteristic of mainstream visual media.

At a time when news media are looking for ways to translate the complexities of global climate change into accessible, affectively charged imagery, wildfire has become a favoured metonym for a planetary overheating. But the coding tends to be crude and reductive, with burning vegetation—wherever, whenever, for whatever reason it occurs—too easily signifying ecological chaos and devastation.

A more spatially and temporally discerning genre for representing global fire is the use of remote sensing to show the distribution of landscape fire or open-field burning across the earth's surface. As part of their online public-oriented Earth Observatory portal, NASA offers an animation of the last seventeen years of terrestrial fire, composited from spectroradiometer readings from the Terra satellite. Fires appear as colour-coded pixels, each one representing a 1,000-square-kilometer area, ranging from white—denoting over 100 fires per day, through yellow—up to ten fires, and down to red for one fire per day:

[VIDEO: NASA Earth Observatory. *Global Maps: Fire.* http://earthobservatory.nasa.gov/GlobalMaps/view.php?d1=MOD14A1_M_FIRE]

While NASA's fire mapping cannot tell us the size of the fire or its cause, what it does do is to begin to bring fire to life—the overall effect being that of a lively pulsing across the earth’s surface that hues to distinct regional and seasonal patterns. Importantly, the accompanying text draws attention not only to the harmful environmental impacts of some forms of burning but also to the regenerative effects of fire in many terrestrial ecosystems and to the coevolution of much vegetation with fire (ibid).

If not quite matching NASA’s quick-time graphical interface, a recent synopsis of global fire trends by geographers Stefan Doerr and Cristina Santín raises profound questions about the stereotypic media portrayal of wildfire. ‘The data available to date’, they conclude, ‘do not support a general increase in area burned or in fire severity for many regions of the world. Indeed, there is increasing evidence suggesting that there is overall less fire in the landscape today than there has been centuries ago’ (‘Global Trends’, 8). While Doerr and Santín acknowledge that there are particular regions such as South East Asia where fire-driven land use change has unequivocally harmful environmental effects, they argue that much of the rest of the world suffers from the equally harmful consequence of ‘aggressive wildfire suppression’ that manifests a western bias against open-field burning (ibid., 2).

Doerr and Santín’s diagnosis resonates with what Stephen Pyne and fellow ‘anti-supressionists’—along with innumerable indigenous or traditional practitioners—have been saying for many years: fire is a natural part of many terrestrial ecosystems, and any attempt to remove fire can have deeply destructive repercussions. As Pyne insists, it is not fire *per se* that is the problem. What we currently have is too much of the wrong kind of fire—combustion of fossilized hydrocarbons—and not enough of the right kind of fire—the periodic burning of biomass that is the natural accompaniment of biotic flourishing (*World Fire,* 323).

And this is one vital way in which the prevailing imagery of planetary fire falls far short of the mark. For what depictions of open field fire are not showing us are the trillions of other ‘enclosed’ combustive events—from the large-scale burning of coal, oil and gas in electric power plants to the immensity of tiny explosions that ignite compressed fuel within the pistons of each of the planet's millions of internal combustion vehicles (see Clark and Yusoff, 'Combustion').

While it is next to impossible to conceive of a representational mode capable of capturing all these enclosed fires and their impacts on the earth system, it is just as difficult to envisage a medium that could provide a comprehensive sense of all the generative and catalytic effects of burning in a fire-adapted ecosystem. For a dataset or graphical interface with enough resolution to convey the awakening of seeds to the stimulus of fire, the purging of pest and pathogens, the laying down of a fertile humus, and immensity of other interlinked transformative effects of fire on a living ecosystem, we might imagine, would need to be near as extensive as the ecological system itself. Not to mention that it would probably require so much energy to run that it would impact upon the very processes it sought to depict.

Both the issue of resolution and the question of why it now appears so important to quantify anthropogenic impacts of fire on earth processes open up another dimension of pyro-mediation. The massive collective effort to measure and model the impact of human activities on global climate has been undertaken precisely to try and understand how the earth system is itself recalibrating in response to changing environmental concentrations of carbon dioxide, methane or nitrous oxide molecules.

So when Pyne speaks of 'the combustion calculus of the earth' (*World Fire*, 322) there is an important sense in which he is literally evoking a calculating capacity that is the planet's own. And one that by comparison to NASA's 1,000-square-kilometer scale has a resolution that is unimaginably fine-grained.

But what does it mean that 'our' best efforts at mediating global fire might be seen as a variation played on the theme of the planet's own geomediation? In conventional usage the distinction between force and signification reenacts a more pervasive dualism: that which divides nature—assumed to be blind, invariant, determined—from a culture that is endowed with cognition, creativity, and indeterminacy. And this raises the question, if fire is implicated in some kind of self-mediation of the earth system, then what manner of event is combustion? Where there is fire power—is there also fire play?

The Play of Fire

So what did Pyne mean when he proposed that, with the emergence of a fire-handling creature, '*the Earth did not get quite what it supposed'?* As he elaborates:

> *The biosphere needed a reliable spark whose timing obeyed biotic rhythms, subject to ecological processes, shaped by natural selection. Ideally ignition would be coded by instinct. A creature would set fires much as elms shed leaves or salmon turned upstream to spawn. What nature got instead was a sentient being whose neural net was short-circuited by synapses of society and culture. The Earth's keeper of the flame kept it for his own purposes* (*Fire,* 26)

With this invocation of a threshold separating natural necessity from cultural eccentricity, it would seem that Pyne cleaves to western thought's most enduring binary. Or is he setting up this dichotomy only to unsettle it further down the line?

Fire is not so much a substance as a chemical reaction. Fire—or strictly speaking, combustion—is the process in which energy-rich carbon compounds are broken down through a reaction with oxygen resulting in the release of heat and the formation of new chemical bonds (see Pyne, 'Fire Age'). As Pyne reminds us, fire and life have a shared chemistry, in that combustion disassembles or decomposes what the solar-powered process of photosynthesis puts together ('Maintaining'). When this breakdown of carbon compounds takes place in an animal cell, he adds, it is referred to as respiration. When it occurs in the wider world, we call it fire.

While a chemical reaction by definition follows a set trajectory, in the case of combustion, Pyne explains, this pathway is conditioned by the elements which fire is synthesizing and transforming. In other words, in real world fire there is always play in the system. Because every fire season and each individual burn combines weather conditions, available fuel-loads, topography and ignition sources, every fire is unique: ‘Real fires … burn in eccentric rhythms’, incants Pyne. ‘They integrate not only seasonal …. cycles, but events that are unexpected, stochastic, irrepeatable, and irreversible’ (*Burning Bush*, 30).

In this way, Pyne systematically unravels his own distinction between instinctive and aberrant ignition. For it soon becomes apparent that the very nature of terrestrial fire means that something in excess of ‘*a reliable spark*’ is required. If every fire season and each individual burn is different, than an accomplished fire-manipulating creature will be compelled to interpret, weigh-up, make choices. Setting fire to work in the landscape, Pyne makes clear, is inevitably a risky business: fire can extinguish itself or escape, it always has the power to become more or less or other than what is expected of it. Because the assemblage that is fire is forever recomposing itself, manipulating flame in the living world is a process of experimentation and learning that never ends (*Burning Bush* 33; *Fire,* 15, 83).

Those western scientists who have come round to an appreciation of the positive role fire can play in maintaining ecosystems are increasingly willing to acknowledge the expertise with which indigenous people intervene in local fire regimes (see Clark, ‘Aboriginal’; *Inhuman*, Ch. 7). Some researchers now speak of ‘pyrodiversity’ in reference to the multiple ways that fire interacts with ecological systems and biodiversity, and there is growing recognition that in many fire-prone regions skilful fire management by indigenous peoples has contributed at once to the diversification of fire and biological life (see Bowman et al, ‘Pyrodiversity’)

It is vital to remember, however, that what eventually becomes a deep-seated understanding, or what is now termed ‘traditional ecological knowledge’, must at some stage—or at many moments—have involved trial and error, lives literally put on the line in the interest of learning to live and work in the presence of flame. Such demands are especially intense when there is significant climate and ecological change—or when migrating humans enter unfamiliar worlds.

As Aboriginal studies scholar Marcia Langton stresses, when the original settlers of Australia first arrived some sixty thousand years ago, they came from wetter tropical regions. Confronting an unfamiliar and fearsome new fire regime, they were obliged to experiment, to improvise, to begin burning anew (*Fire,* 169). So too, Langton adds, would Aboriginal populations have had to redevelop their fire skills when global climate change brought warmer and drier conditions to the Australian continent at the close of the last glacial epoch (*Burning Questions,* 49-50).

There is an ancient theme in western thought that alludes to this implication of the determined and the undetermined of which we have speaking: 'fire and games being always a play of luck with necessity, of contingency with law', as this line of thought would have it (Derrida, *Dissemination*, 277). Though there are sound reasons to imagine that this is a motif that resonates far beyond the west.

But is it only human agents who experiment with fire; is it only a fire-handling species who finds itself caught up in the fiery play of essence and variability, hazard and opportunity? Or is this the way of a fire planet itself?

Contemporary fire researchers have shown that the mutually transformative relationship between fire and ecological systems—the interplay of pyrodiversity and biodiversity—long precedes any human presence. In the words of botanists Bond, Woodward and Midgley: 'the global extent of fire-dependent ecosystems is not merely an artefact of recent anthropogenic burning. They have existed long enough to evolve distinctive biotas' ('Global Distribution', 165).

We can think of this co-evolution between fire and plants, as some evolutionary biologists have tended to do, as a process in which environmental conditions assert their inexorable pressure on the genetic makeup of a population of organisms. Or we might follow other schools of thought that draw attention to the complex co-implication of organisms and their environment and affirm the indeterminacy of the genetic coding of biological life.

It is these more ‘open-ended’ approaches to evolution that have prompted what is by now a lengthy discourse on the continuity between ‘chance and necessity’ in the biological domain and in realm of human language and culture. Following this line of inquiry, some theorists have come to see life itself as a kind of semiosis, as a field imbued with meaning, translation, communication, miscommunication. Though perhaps most of us are still catching up with the ‘ancients’ when it comes to extending this conversation to include fire.

Geographer Lauren Rickards—unsurprisingly writing from the Australian context—offers an account of the way the life cycle of fire-adapted plants is dependent upon a complex system of interpreting environmental signals. Rickards speaks of the way ‘parental’ plants ‘fill themselves with oils in order to ignite the life cycle of their young…. offspring that are awakened by complex chemical signals, to find an abundance of ashy nutrients’ (‘Fire Within’, n.p.). She goes on to note how human-induced climate change, with its impact upon fire regimes, is impinging upon this communicative process: ‘many long-awaited seedlings are bursting out of their seed bank vault into hostile not nurturing circumstances, tricked into shedding their protective coat by the fraudulent smoke and concocted climate of our own combustion activities’ (ibid).

But if anthropogenic climate change is currently scrambling the codes through which fire and life interact, there would seem to be no reason why climatic or earth system change with other—nonhuman—drivers should not also exert a differential force on the signifying system of life itself. For as Rickards reminds us, ‘adaptation is necessarily experimental’ (ibid)—and in the case of fire and life this adaptation has been going on ever since plants first colonised the continents some 400 million years ago. In other words, whether or not ‘we’ are present, fire and life are reading, testing, provoking each other.

Experiments by definition have more than one possible outcome—they can succeed, they can be too successful, they can fall short, they can go awry. Or they can unsettle the very categories or grounds by which such judgements might be made. But if we can imagine fire in its constitutive entanglement with life as at once force and semiosis—and all the possibilities of 'fraudulence' or miscommunication that this implies—what might this mean for the earth in its entirety? Is it conceivable that the planet which expresses itself in fire can misread its own incendiary provocations, its own blaze of signification?

PyroGaia

For the past 350 million years—the majority of the time that fire and plants have been co-evolving—the earth's atmospheric oxygen concentration as been remarkably stable, hovering around 21%. Experimental evidence suggests that with an atmospheric composition of less than 12% free oxygen fire smoulders and fails to flare. Over 25% and most of the planet's vegetation would likely be consumed in almighty conflagrations (see Lovelock, *Gaia*, 70-2).

Either extreme seems unlikely as it is life itself—more precisely, green plants—that generate oxygen as a by-product of photosynthesis. 'If life were extinguished, the available free energy for lighting fires would vanish just as soon, comparatively, as oxygen vanished from the air', observed chemist and inventor James Lovelock in a slender but consequential volume published in the late 1970s (ibid., 38).

The title of the book was *Gaia: A New Look at Life on Earth*. It consolidated and popularised a hypothesis—first proposed by Lovelock in the late sixties—that the earth's surface is a complex interacting system in which living things themselves collectively play a 'homeostatic' role in sustaining the conditions conducive to the continuity of life-in-general. By the time *Gaia* was released, the hypothesis had received a significant boost from the input of evolutionary biologist Lynn Margulis, whose research highlighted the utterly indispensible part played by microorganisms in generating and sustaining the biosphere.

Gaia theory has taken many twists and turns, but along the way it made significant contributions to the emergence of the integrated, interdisciplinary field of earth system science—from which the Anthropocene thesis emerged at the turn of the 21st century. While the now prevalent understanding of the atmosphere, hydrosphere, biosphere and lithosphere as being closely integrated—or 'tightly coupled'—had a complicated genesis, it was certainly boosted by Lovelock's bold vision of life's coupling with the nonliving components of the earth system.

One of the axioms of the Gaia hypothesis is that life holds the earth in a state far from equilibrium. From its early articulations by Lovelock, fire has been seen to play an important role in this planetary self-regulation—at least after fire's proliferation following the establishment of land-based plants (*Gaia*, 70-2).

There is more to this than the simple fact that plant growth produces more oxygen—and therefore more vegetation-consuming fires. As climate scientist Tim Lenton explains, with any rise in atmospheric oxygen concentrations there is higher prevalence of fire—which results in a shift from forest to faster regenerating landscapes; especially grasses. And this means less organic carbon burial, which in turn lowers the proportion of oxygen in the atmosphere. As Lenton concludes, 'this mechanism is extremely effective at regulating against rising oxygen because of the high sensitivity of fire frequency to rising oxygen' ('Gaia', 819)

But this is a complicated process, and fire's role in negative feedback—the proposed dampening or equalizing effect it has on the earth system—has also been questioned. As we have seen, Anthropocene progenitor Paul Crutzen has done extensive research on the interplay of fire and atmospheric composition. Along the way, he has offered an important supplement to the more homeostatic construction of Gaia. Crutzen proposes that from time to time the earth system's self-regulation lurches into a kind of runaway destabilisation. At these junctures, the predominance of stabilising negative feedback processes in the system is 'interrupted by disastrous breakdowns of the existing *equilibria* and adapted biospheres resulting from extraterrestrial causes and internal destabilising forces in the highly chaotic Earth System' ('Anti-Gaia', 72).

One example Crutzen offers of such 'hurting' rather 'healing' episodes is the Snowball Earth phenomenon: the near-global glaciation some researchers believe to have occurred 2,200 million years ago and again 600-750 million years ago—which resulted each time in massive die-offs of biological life. To this example he adds that the effect of fire over geological timescales is not necessarily confined to negative or self-regulating feedback: recurrent fires can actually increase organic carbon (charcoal) burial—thereby increasing oxygen levels—and promoting more fire (ibid).

Crutzen also proposes that in the event of major external perturbations fire can aggravate rather than ameliorate disruption to the earth system. In the case of the massive meteor impact that marks the shift 65 million years ago from the Cretaceous to the Tertiary periods (the K-T boundary), widespread forest fire triggered by the collision may well have filled the atmosphere with black, sunlight-absorbing carbon particles—greatly exacerbating the life-extinguishing drop in planetary temperatures resulting from the cataclysm (ibid).

It's important to recall that the 'Anti-Gaia' dynamics highlighted by Crutzen interrupt rather than preclude the more homeostatic contributions of life and fire. Likewise, Lovelock himself was well aware that positive feedback also plays a significant role in the living planetary system. 'Periods of positive feedback, unstable, even chaotic, behavior,' he noted, 'are characteristic of working control systems and of living organisms' (*Ages*, 220)

In this regard it's worth returning to Lenton's 'climatological' take on Gaia. Lenton notes that the rapid fluctuations between ice ages and briefer interglacial warm periods over the last 2.5 million years of geological history could well be seen as incommensurate with the basic Gaian idea of a self-regulating planet. However, he continues, 'this is indicative of a regulatory system, but one that is near the limits of its operation, with positive feedback coming to dominate over negative feedback' ('Gaia', 820).

With the potentially disastrous impacts of human activity on the earth system in mind, Lenton suggests that the prevalence of positive feedback during the move in and out of recent ice ages may be a sign that the planet is ‘unusually vulnerable’—which is to say, more susceptible to runaway, self-reinforcing change than at earlier moments in its history (ibid). This builds on a more general point made by Lovelock that as our sun grows ever more luminous, we might see the Gaian system itself as aging. He proposes that during the planet’s Proterozoic ‘middle age’, the sun’s output was at an optimum for life, whereas it is now—some 1.5 billion years later—becoming increasing difficult for the earth system to maintain a stable temperature (*Ages*, 118).

By this logic, fire first emerges at a historical moment well beyond the earth’s ‘golden years’, and a creature with the faculty for proliferating flame appears at point of advancing planetary vulnerability—a stage at which we are more likely to see the kind of feedback processes that amplify perturbations into runaway, cascading events.

Lovelock himself eventually moved away from the idea that Gaia ‘optimizes’ the conditions for life, having recognized that this imputes a teleology to what is better seen as an emergent effect of an immensity of directionless acts. This reading has recently been teased out by social theorist Bruno Latour, who stipulates that there is no Gaian ‘superior level’ or ‘totality’, only a non-additive coalescence of a great many agencies—or what he describes as *‘connectivity without holism*’ (‘Why Gaia’, 75).

And this means that there is no position, no elevated platform from which judgment might passed on any particular operational state of the living earth system as superior to another. Or as Bowman and his co-researchers put it, in a related sense but at a different scale: ‘pyrodiversity is an ecological state that is neither ‘good’ nor ‘bad’’ (‘Pyrodiversity’, 8).

As earth system science continues to develop, there is growing emphasis on the way that the very inter-connectivity of the planet’s subcomponents is itself the condition of emergent difference within the system. Integration or tight coupling implies unity, but the corollary of this togetherness is a deep, abiding differential force. As chair of the Anthropocene Working Group, Jan Zalasiewicz recently put it: ‘The Earth seems to be less one planet, rather a number of different Earths that have succeeded each other in time, each with very different chemical, physical and biological states’ (cited in Hamilton, ‘Can Humans’, 6).

In this way, integration and dis-integration, continuity and rupture in the earth system increasingly appear to be structurally inseparable (see Clark, ‘Anthropocene’). To put it in Jacques Derrida’s terms, we could say that the earth ‘harbours non-identity within itself’ (*Dissemination*, 119): that is, that difference, disjuncture or otherness in the earth system is not a deviation from primordial wholeness, so much as an originary complication.

As Gaia theory justifiably affirms, the more-than-living earth has been profoundly resilient. Catastrophic Snowball Earth episodes may well have occurred, but Gaia rebounded, as it has done from other climatic upheavals, meteor impacts, supervolcanoes and million-year long flood basalt eruptions. Remarkably, as solar radiance has intensified—the sun is now 25% more luminous than it was when life first emerged on earth—the earth has cooled rather than overheated (see Lenton, ‘Gaia’, 816; Margulis, *Symbiotic*, 146-7). But the ‘other’ of this resilience—or rather the otherness that inheres in the very phenomenon of resilience—is the potentiality for the rapid, effectively irreversible systemic change that occurs when a system is pushed, or pushes itself, past a threshold.

The earth’s dramatic transformation into a fire planet—what I am calling PyroGaia—occurred some four million years ago when the planet might already be considered to be ‘aging’. While it may be a late achievement, fire has become a vital mode of mediating between the living and nonliving earth, especially between the biosphere and atmosphere. But with its inbuilt propensity for positive feedback—evidenced especially in the co-evolution of fire and fire-tolerant or fire-loving life forms—fire is also a wager. In short, there is no fire—local or planetary—that does not have the potential, sooner or later, to run away, to become *more than the Earth supposed*.

Only in the last million or so years did a fire-manipulating organism emerge from PyroGaia's wide-ranging and ongoing selection in favour of pyrophilic life. In turn, this creature proliferates and diversifies fire, greatly accelerating the selective pressures for other fire-prone or 'pyrophytic' species. And then, only in the last few centuries, after a multi-millennial succession of experiments—did some of these fire-wielding creatures commit themselves to the combustion of buried and fossilized phytomass.

The repercussions on the earth system of this turn to burning fossil hydrocarbons are now well documented. But is this event anomalous, aberrant, some kind of alien irruption on earth, I am asking—or can we understand fossil fuel combustion as being somehow *of* the earth or *through* the earth, and perhaps no less remarkable for this? This question brings us back to the issue of mediation—and to the potential for multiple readings or mis-interpretation that all media share.

Ignition, Cognition, Misfiring

In his early writings on Gaia, Lovelock considered how the collective sensing and communicative faculties of *Homo sapiens* were extending the planet's sensory apparatus. As well as speculating that humans might be bringing the earth to self-awareness for the first time, however, he also spoke of Gaia's own much more ancient 'intelligence network' (*Gaia*, 148, 46). Margulis, ever ardent in her non-anthropocentrism, extols the latter: 'Gaia, the physiologically regulated Earth,' she insists, 'enjoyed proprioceptive global communication long before people evolved' (*Symbiotic*, 142).

In the course of reviewing a range of Gaian thinkers on the question of the planet's own sensory and communication capacities, literary theorist Bruce Clarke offers the following elegant summary:

> Some three or so billion years ago, when a critical mass of biotic, biogenic, and abiotic elements fell into a closed loop locking in an emergent level of metabiotic autopoiesis, life and its environment

> coupled together to produce a primal regime of planetary cognition ('Rethinking', 17).

Drawing upon and developing Derrida's thinking, Vicki Kirby also pushes the idea of the mutual implication of matter and sensibility far beyond the human domain—in ways that can help us explore the link between the self-sensing and the self-differentiating capacities of the planet. Any 'body' that is internally differentiated or non-self-identical, Kirby contends, must also have a way of mediating its own difference or otherness, it requires a kind of inner communicability to hold itself together enough to persist in time and space. In short, a complex, open and heterogeneous entity must communicate in order to keep in touch with itself—and it is by virtue of this very self-intelligibility that a body, system or world explores its own internal possibilities (*Telling Flesh,* 37, 113). And so as Kirby would have it, there is a general sense in which semiosis, signification, or language can be construed 'as the system's playing with itself' (*Quantum*, 37).

In this regard, we might conceive of fire—at least in the 'later' earth—as a key aspect of planetary cognition, a medium that at once contributes to the divisive processes of earth's own self-differentiation and plays a vital role in working across and suturing together the rifts which open in the body of the planet.

Fire, we have seen, is part of the positive feedback that is more intense in times of geophysical disturbance and transition. Though 'fire can be found nearly everywhere', Pyne observes, 'it appears more profusely during times of rapid and extreme climatic change' ('Maintaining', 890). So too does fire often flare at the fault-lines and collision zones on the planet's surface where tectonic plates are colliding or tearing apart. And it looks to have been at one such juncture—the volcanically active and fire-prone landscapes of the East African Rift Valley—that primate species first learned to handle and proliferate fire (See Clark, *Rock*).

As the notion of pyrodiversity suggests, the spread and multiplication of novel forms of fire may be as much a manifestation of the earth's probing or playing with its own possibilities as is the radiation of biological life into new forms and niches. Or to put it another way, the proliferating and diversifying of fire is a late and especially intense elaboration of Gaia's 'intelligence network'.

But the idea of tongues of flame being part of the earth's metabiotic self-communication—of planetary ignition being integral to planetary cognition—brings us back to the openness of interpretation, to the constitutive possibility of reading messages in more ways than one. It returns us, to Pyne's earth not getting '*quite what it supposed*'—to a planet we might see as literally capable of *supposition*.

While Derrida may not be the first theorist we would reach for when confronting the dynamics of the earth, there are good grounds for extending his structural logic of the trace (and what he later refers to as auto-immunization) to the planetary scale—especially if we take our cues from Kirby's positing of articulate and thoughtful *worlds*. As Derrida argues, any system or being complex enough to negotiate with its surroundings will need some way of regulating its exchanges, of distinguishing self from other, and of deciding what 'otherness' is desirable and what is not (*Rogues,* 123).

And this process of self-regulation, he contends, always comes with the possibility of misrecognition: the risk of failing to respond to danger—or equally of turning against or overreacting to the otherness within. What Derrida in his later work describes as auto-immunization, refers to 'this strange illogical logic by which a living being can spontaneously destroy, in an autonomous fashion, the very thing within it that is supposed to protect it against the other, to immunize it against the aggressive intrusion of the other' (ibid).

Although he most often deploys the concept of auto-immunization in socio-political or biological contexts, Derrida also—citing fellow philosopher Dominique Janicaut—tantalising suggests that the possibility of a self-regulating and articulate entity turning against itself may extend to 'the fragile destiny of the planet' (*Rogues*, 117).

It is also notable that, while Derrida over the course of his career conjured all kinds of conceptual figures to help probe the logics of communicative unpredictability and self-violation, he finally alighted on fire—more precisely, the potentially fire-proliferating cinder—as his preferred instantiation. ‘I have the impression now that the best paradigm for the trace’, he wrote, ‘is not … the trail of the hunt, the fraying, the furrow in the sand, the wake in the sea, the love of the step for its imprint, but the cinder’ (*Cinders*, 43, see also Clark, ‘Rock’).

There is a resonance, I want to suggest, between the Gaia/Anti-Gaia interplay and this sense of structural entanglement of self-defense and auto-immunization—a common logic which asserts that every form of regulation dices with self destruction, every adaptation harbours mal-adaptation, every informatic overture risks an outburst or cacophony. When it comes to fire, most of us already have some sense of this: the fire that cooks can char and incinerate, the blaze that warms the house can burn it down, the flaming torch can reduce to ashes the very world it would illuminate. As it is for us, I am suggesting, so it is for the earth.

Pyropolitics for a Fire Planet

The living or metabiotic planet, we can safely say, did not know in advance what it wanted from fire (any more than the hominid who inherited this fire). But as we have seen, the very logic through which PyroGaia gives rise to a regulatory or homeostatic fire also engenders the possibility of flame exceeding its remit—which may not make the eventual emergence of a fire-proliferating creature a necessity, but neither does it make it a complete shock or aberration (see Clark and Yusoff, ‘Combustion’).

The fact that we as fire-starters might enfold and embody some of the planet’s own contrariness, its own self-violating potentiality, does not make us innocent—any more than it makes the earth guilty. None of what I have been saying is meant to exonerate those who continue to combust fossil hydrocarbons in the face of a world of evidence that this is pushing the earth system into a new and unfamiliar operating state. Neither is it intended to absolve those who have appropriated landscapes that had been skillfully crafted by fire for centuries or millennia by their first peoples.

As Derrida urges, the inescapable risk of systemic misrecognition or self-violation is not a reason for abstaining from political or ethical engagement. It is ubiquitous presence of incomplete knowledge or ‘undecidability’—rather than the (unattainable) certainty of a program—he proclaims, that is the condition of possibility of ethics and politics (‘Force’). We might say, it is our and the earth’s own potentiality for mis-firing and runaway conflagration that makes a necessity of pyropolitics. Or as Stephen Pyne deftly puts it: ‘fire forces decisions’ (*World*, 327)

As Pyne likes to point out, a million or more years of stoking the earth’s pyrophytic tendencies comes with responsibilities (*World Fire*, 322—7). Similarly, philosopher Michael Marder rightly insists that ‘pyropolitics is co-extensive with the concept *and* the event of the political’ (*Pyropolitics*, 10). Marder’s own probing of the insurrectionary connotations of fire, however, could do with a good injection of the gritty, grimy hands-on materialism of Pyne’s fire histories. For if our contemporary orientations toward fire cry out for heated deliberation, contestation, re-negotiation, so too do the exigencies of the pyropolitical call for messy entanglement, material experimentation, and corporeal commitment—as they have always done (see Clark, *Inhuman*, 164-5). Trials of fire, in short, summon a politics that is at once a matter of signification *and of force*.

As many scientists, activists, land-managers and pyro-practitioners have figured out, it is a matter of urgency to cut firebreaks in the runaway combustion of fossil fuels. Less acknowledged, but no less expedient, is the need to protect, revitalize and invent other forms of combustion—to ensure that we have the pyrodiversity out of which to forge alternative worlds (see Clark, ‘Fiery Arts’).

As the changes in the earth system which are now in motion proceed along their largely unpredictable trajectories, the earth itself will undertake a new wave of experimentation—and we, PyroGaia’s preeminent fire species—will be compelled to respond with experiments of our own. Not all these experiments will succeed. So we may also be called upon to assist others whose interventions fail to ignite, fall short, or blaze out of control. As we may find ourselves, ashen or singed, having to appeal to them.

Through the example of fire, I have been suggesting, geomediation—understood here as mediation of the earth by the earth—is itself a differential power, an informatic force at once capable of unmaking and re-composing worlds. Planetary cognition—if it is anything—is playful, fractious, irreverent. It might even be said that the earth is primordially inclined to make mistakes, if that did not imply that we, some proxy observer, or the planet itself had a final criterion to distinguish success from failure.

Fire may be only one of a range of Gaian sensory faculties, but in its entangling with terrestrial life it seems also to be a medium that gathers and intensifies systemic perversity. At risk of inflating our own force and significance, a case could be made that as the planet's first and only fire-using creature, we are an especially volatile compound, a being whose originary co-implication with fire imbues us with a particular capacity for unrestrained, un-self-controllable behaviour.

But some measure of comfort should be taken from the many human populations, across the times and spaces of the earth, who have painstakingly learned to temper and direct the power they draw from fire.

As Lieutenant John Lort Stokes—shipmate of Charles Darwin on *HMS Beagle*—recounted in 1840, he had observed fire-wielding Australian Aborigines 'engaged in kindling, moderating, and directing the destructive element, which under their care seems almost to change its nature, acquiring, as it were, complete docility instead of the ungovernable fury we are accustomed to ascribe to it' (Cited in Pyne, *Burning Bush*, 230-1, u. plate; see also Clark, *Aboriginal,* 740).

While such a degree of control may only ever be provisional, it is worth considering that literacy in the multiple, mutable and equivocal tongues of flame may well be our original—and most enduring—way of conversing with our pyrophylic planet.

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