

The Global Perspective. Conceptualising Fire in Past, Present, and Future Settings

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Abstract

The Earth is a uniquely fire planet and humanity, a uniquely fire creature. The past and future of fire will continue to derive from our coevolution. The primary drivers will be the continued expansion of industrial combustion, large-scale shifts in land use, the rise and fall of fire-management institutions, and changes in our conceptions of fire. In particular, we need to recreate a role for ourselves as constructive fire agents.

These are interesting times for fire planet Earth. There is too much of the wrong kind of fire, and not enough of the right. Globally, there is too much combustion and not enough fire. No place seems to have the right mix. Observers share in this confusion. They note that fire is simultaneously natural and anthropogenic, creative and destructive, useful and dangerous, necessary and wasteful, universal and particular; a tool, a process, a chemical reaction, an event, a symbol, a social catastrophe, a hominid heritage. The history of fire is the history of the Earth since the Devonian and the history of humanity from its origins. Since fire synthesizes its surroundings, its history is, very nearly, a history of everything.

Still, three narratives stand out as particularly enlightening - a fire history triangle, if you will. There is, first, the general story of fire. The past 150 years have witnessed a revolution in planetary combustion. Second, there is the peculiar story of European expansion and its creation, over the past two centuries, of a handful of nations with extensive, fire-prone public lands. These remain the world's natural firepowers. Third, there is the evolving story of how people conceive fire, particularly those peoples best situated to impress their understanding on the rest of the world. Braiding these three narratives together can explain much of why the world is burning, or not burning, as it is.

Fire's Narrative

Fire exists because the Earth holds life. Life pumped the atmosphere with oxygen, life lathered the land with hydrocarbons. The chemistry of combustion is among life's most elemental reactions. Combustion simply takes apart what photosynthesis puts together. The "slow combustion" within cells we call respiration. The "fast combustion" outside organisms we call fire. For more than 425 million years fossil charcoal litters the sedimentary record.

Natural fire is lumpy. Naturally-ignited fire occurs in patches and pulses, driven by a two-cycle engine of wetting and drying, shaped by the kinds of biomass that may or may not thrive under such a regime, waiting on lightning's lottery to kindle. Much of the Earth doesn't naturally burn. It is too wet, too dry, too disconnected from a routine source of ignition. Much of the historical Earth so failed to combust that vast quantities of biomass were simply buried. Nature's economy, in brief, lacked a broker that could match flame with fuel.

That changed with the arrival of the later hominids. It seems that Homo erectus could tend fire, could keep it alive in caves or hold it in torches or slow matches. Probably not until Homo sapiens, however, could humans start fire more or less at will. Still, it was easier to keep fire alight than to continually rekindle it; the perpetual fire is a very old (and very practical) habit. So it became with nature, also. The sputtering flame became constant, something that accompanied people wherever they went; and they went everywhere. One species acquired a monopoly over fire that it will never willingly surrender.

Since the first tread of Homo sapiens, fire ecology has thus meant human ecology. People burned for their own ends, and they sought out particularly those landscapes where flame could take readily. They inscribed lines of fire and fields of fire that laid down a new mosaic, they kindled flame according to new rhythms, they leveraged their ecological firepower with hunting and foraging. It was these regimes to which biotas would have to adapt. Under the right conditions, their flame-mediated manipulation could resemble an intensive cultivation, famously characterized by Rhys Jones as "fire-stick farming."

Yet that power had limits. Not every spark took, not every fire could propagate. The fact is, tough limits remained on anthropogenic fire. Mostly, people could only work with what nature presented to them by way of weather and fuels. They could not often bring fire where nature would not allow it. They seized fire-rich sites and those fire voids that lacked only ignition to burst into flame. They sought out places with vigorous wet-dry cycles that could crack open a biota the way a frost-thaw cycle could rock. But they could not break into shade-laden woods empty of dry tinder or hold the frontier against blurred seasons and chronic wetness. The firestick could nudge vast ecosystems, as it did much of Africa, or even move whole continents, as it apparently did Australia, but only if it had a suitable fulcrum.

The early keepers of the flame knew full well both their power and its limits. The possession of fire made them unique, distinct among creatures, yet their firepower itself flowed from nature, which inscrutably gave and withheld. Their fire-starters were stone, wood, bone; their myths often told how fire leaped out of wood or flint when freed from its bondage by people. So, it seemed, had humans freed flame from nature's fickle thrall and then held it, as best they could, as their own.

This changed as people began to manipulate fuel as they did ignition. They could create kindling, on a landscape scale. They could slash, grow, chew and trample with their domesticated beasts, or otherwise cultivate combustibles. Fire was only as powerful as its fuel: now those fuels expanded. Almost any biomass could serve - woods, scrub, sod, peat, stubble, dung, pine needles, even seaweed. To feed the fires meant searching out new sites for slashing, or allowing old ones to regrow, or in more desperate straits, hauling fuel from elsewhere to the site. Here is a partial explanation for the practice of fallowing. The abandoned field was not burned as waste, but grown in order to be burned. The field - at some point in its cycle - needed fire. And fire needed fuel.

The domain of cultivated fire spread far beyond the realms of aboriginal fire. Even dense shade forests, upland peats, and swamps could be minced, dried, and burned. Fire spread to wherever cultivated plants or domesticated livestock could thrive. Throughout the Holocene, some variety of fire-fallow agriculture spread over the Earth, from African rainforest to Andean plateaus, from grassy steppes to upland peat, from mediterranean scrub to eucalypt woodlands. Everywhere fire regimes altered. Fire existed in places that had not known it

previously, and it morphed in places whose previous regimes now throbbed to new rhythms and arrangements. Most of the Earth's combustion still resides within the dominion of fire-fallow agriculture.

Yet this, too, had limits. One could only coax or coerce so much biomass from the land. To burn more fuels than could be restored was to snuff out cultivated flame, not stoke it. If humanity craved more firepower, it would have to find another source of fuel, which it did in the form of fossil biomass. In effect, people excavated whole landscapes from the geologic past, kindling a new world of combustion. This, for fire history, is the meaning of the industrial revolution. The burning of fossil fuels is the deep driver of contemporary combustion, the great biological rearranger of burning, the dark attractor of Earthly fire.

The planet is fissuring into two great combustion realms - one fed by living biomass, the other by fossil biomass. It is estimated that 60% of the global emissions from burning derive from industrial fire. We have barely begun to understand, in any systematic way, what this means; how industrial fire cascades through a trophic chain of combustion ecology. There is some consideration of how this outpouring might affect the atmosphere, particularly greenhouse gases and global warming. But there is no coherent assessment of how it shapes fire regimes on the surface, or even a general recognition that it shares a common combustion history. The fact is, industrial, anthropogenic, and natural fires compete. How they do so may be the most fundamental three-body problem in fire scholarship.

The mechanisms behind this transformation are not understood. The primary process seems to be one of technological substitution. Fire as a tool - combustion as a source of heat and light - is amenable to flameless replacements. Domestic fire goes, followed by manufacturing fires and agricultural burning. Yet industrial societies typically extend the reach of their contained combustion into wildlands as well. Here, where fire behaves more as an ecological process than as a mechanical implement, the substitution takes the form of suppression, with generally paradoxical and often deleterious consequences.

This pyric transition itself is immensely significant. The fire problems of the developed nations are largely those inherited from their passage through the pyric looking-glass. So, too, knowledge about what such a passage means holds considerable meaning for developing nations as they maneuver through that same transition. What institutions do they need? What policies are useful, which misguided, which irrelevant? What fire practices should be preserved, at some cost if necessary, and what should be gratefully shed as a country moves from a context of rural fire to one dominated by industrial fire? Does the pyric transition itself reveal patterns - offer suggestions about how to seize and slip through the opportunities and obstacles?

It does. There seems to exist a demographic transition in fire similar to that for humans. The old fire practices remain, while new ones proliferate, with the upshot that the population of fire explodes. Eventually, industrial fire snuffs out the old versions, and the population fails to replace itself. Early industrializing nations thus have a surplus of fires, including many abusive ones. Mature industrialized nations may lack those burns they need for biotic purposes. During their early industrial evolution, nations seek to suppress the excess fires; later, they try to overcome the shortfall. Fire agencies have little direct control over these processes. Rural fire vanishes, ultimately, because rural populations fade away along with the economy that sustained them. Fire did not disappear from much of the United States, for example, because Smokey Bear hectored children into shunning matches. It disappeared

because society found combustion alternatives to open fire as a tool and because a rural economy, which had relied on open burning, withered away.

Societies dependent on industrial fire have their combustion pathologies. The removal of fire may be as ecologically powerful as its introduction; many such countries suffer a fire deficit in nature reserves. The urban recolonization of rural landscapes, typically - ardently - accompanied by an abolition of open flame, has slammed the wild and the urban together, a collision of environmental matter and antimatter, with frequent explosions. In fire-prone lands, industrial societies have often discovered they have exchanged a domesticated fire for a feral one. Fire, they have learned, is not simply a tool to be handled or discarded by people at will. It is also an ecological process whose removal can unravel the tapestry of landscapes. Even as flame vanishes from everyday life, it reappears in episodic eruptions.

The Institutional Narrative

It is one of fire's profound paradoxes, that, while most of the world's fires flourish in one setting, its science and infrastructure thrive elsewhere. Most of the planet's fires reside within agricultural societies; most of its fire institutions are welded to the wildlands of industrial societies, particularly those descended from Europe. The successive hosts of these international conferences - the United States, Canada, and Australia, the leaders of a small club of Earth's fire powers - illustrate this dynamic perfectly. (To round out the Big Four, we should add Russia.) Even as such nations identify fire as a "problem," the practical geography of open burning continues to shrivel under the desiccating blast of industrial combustion. Flame persists largely on public wildlands.

Wildland fire management is, in truth, a state-sponsored task, or more specifically, a peculiar legacy of European imperialism. The handful of fire powers are the product of an Enlightenment Europe that colonized widely amid fire-prone landscapes and left a residue of public (or Crown) lands behind along with a bevy of institutions to administer them, largely under the control of foresters. The administration of wildland fire was, in its modern creation, an imperial act, beginning with British India and French Algeria. The experiment worked best, however, where the indigenous peoples were removed from such lands, by disease or forced relocation. This left vast blocks of bush outside active settlement, and encouraged a quixotic belief that such lands, now depopulated, had always been truly "wild," beyond the historic touch of humans. Many such landscapes were fire-prone, which committed the state, however reluctantly, to cope with fires; in the early years, fire protection frequently dominated administrative agendas; forestry's proconsols responded by creating an army of occupation to quell the ecological unrest stirred by the new regime. Our understanding of fire management, of the scope of fire science, of what kinds of fire institutions are appropriate, of the very nature of "fire" as a "problem" - all derive from these peculiar historical circumstances.

Its heritage has colored the way the fire management has disseminated. It has shaped how the major fire powers have broadcast (or exported) their example to developing countries or to countries that have, in recent times, begun to establish public lands for one purpose or another, which explains the frequent mismatch between the means proposed and the ends to which they may be put. The big powers may be misdefining the core problem - proposing solutions to the question of colonization and public domains, for example, when the driving concern is managing the industrial transition. The fire problems of the world extend far beyond the berm of public lands left by a receding imperialism. Transmigration schemes in Indonesia and Brazil, abandoned agricultural lands in the northern Mediterranean, the

intermix fire along the metropolitan fringe, questions of restoration ecology, private landholders and nature reserves, NGOs engaged in fire management, fitfully industrializing rural economies - the classic wildland fire schemes mean little in such contexts. They demand a new suite of institutions, policies, practices.

But even within the major fire powers, such institutions have experienced a profound redefinition. The past half century has been one of decolonization. With breathtaking speed, Europe surrendered its global imperium; more slowly, the administrative infrastructure it left has frayed, or collapsed, or been rebuilt. This process has also occurred in its settler societies, where Europeans achieved a demographic takeover and where the public lands remained largely uninhabited. Imperial institutions - fire protection, no less than the others - find themselves increasingly out of synch, not only when applied to other countries but within the host countries. Instead, they are morphing under pressures to devolve, to privatize, to renegotiate native claims, and to shift from serving the needs of a rural, industrializing country to an urban, developed one. Everywhere state-sponsored forestry is fracturing, further stressing the bushfire protection systems that state foresters had typically overseen. What should replace it, however, remains murky.

In two years the U.S. Forest Service will celebrate its centennial. Loosely modeled on the Indian Forest Service established by Britain, it no longer works as it did in the early 20th century. It barely works at all. One reason is that the country lacks consensus on what the national forests should be, although general agreement does exist that the goals and devices of forestry should not direct their administration. Nature protection, biodiversity, recreation - such purposes, not logging and ranching, should guide oversight. The public lands are moving from an economy of commodity production to an economy of services, and from a command-and-control system of fire suppression to a more community-based suite of negotiated fire practices.

It may be that, in the end, the agency itself will cease; that, having accomplished its historic task, it will be retired; that new institutional arrangements will arise. The public lands, after all, are a relatively recent invention. They could change substantially, or even disappear, at society's pleasure. Certainly foresters have lost their privileged status as an oracles and engineers of fire. Arguably, the most successful fire practitioners are non-governmental organizations like The Nature Conservancy; the arenas most in need of fire treatments are privately owned lands; and boutique burning in niches, or an archipelago of sites, may be more productive for biological purposes than broadcast treatments of unbounded public estates.

The irony almost folds upon itself, like a Mobius strip. While early foresters brazenly proclaimed that fire protection was 75-90% of American forestry, they also dismissed the task as something that serious, science-based administration would leave behind, as though fire were a childhood disease that one grew out of. Fire protection was not forestry, only a precondition to forestry. Today, some 40% of the Forest Service budget relates to fire; apart from logging, which has been steadily strangled, it is virtually the only task with which the public identifies the agency. Instead of withering away, fire dominates its horizon, yet foresters, for all their hard-won expertise, still fail to see that fire management may be itself the core mission of the agency, that fire qua fire is both a means and an end, that proper fire management is the index of successful land management. The institution would not be a fire agency once, but forever.

So the institutional scene is unsettled. What kind of fire infrastructure should exist? What is the proper role of government? What variety of research is needed, to what kinds of questions, under what range of sponsors? What global arrangements might be desirable? In brief, the times offer an occasion for extensive nation-building in fire management. The issue applies not only to developing countries, and those new countries from the continued breakup of former empires, but to those nations with an existing apparatus that no longer meets the goals society wishes.

Modern fire protection is a political invention. It is not enough to buy more engines and niftier nomex clothing and sponsor scientific studies. The nuclear issues are social and lie outside the realm of science; they involve cultural values and politics, and an honest resolution will demand better values and sounder politics. As yet, however, we have barely begun to study in any systematic way the politics of fire. The one near-certainty is, the era of the imperial model has passed. It doesn't work within nations, and it has little relevance between nations.

A Narrative of Fire Conceptualizing

What must also pass is the understanding of fire that has evolved over the past century. Fire scholarship remains almost exclusively fire science, an enterprise still knotted to its origins in state sponsorship. It is no accident that the main centers globally for fire research are precisely those nations that have fire-prone public domains. But the science itself is warped by the demands, overt or implicit, of its sponsors, which have defined fire as a social problem in need of administrative control.

Fire science has traditionally meant fire behavior, itself defined as fire physics. Combustion exists as a chemical reaction: the fire environment is one defined by weather, terrain, and fuel. The critical measures of fire are heat flux, fireline intensity, and rate of spread; of fuel, its size, arrangement, and moisture content; of fire regimes, the size, frequency, intensity, and seasonal timing of "fire events." This makes sense administratively because such properties directly relate to questions of fire control. They make sense scientifically because these properties can be roughly measured, and experimental fires, within limits, can be replicated under laboratory conditions. This research program emerged after World War II and succeeded in wresting fire away from its smothering embrace within forestry, which had barely advanced beyond the statistical analysis of fire reports. The fire science community can be justly proud of what it has achieved under this rubric.

But of course the program has its downside as well. The agenda strongly suggests that fire ecology follows from fire behavior, which is largely driven by climate, as modulated by terrain. It thus boxes the living world within a handful of physical parameters, such that the organic world exists as particles and arrays of "fuel" as "seen" by the heat flux of a propagating physical-chemical reaction. Fire ecology becomes the study of before-and-after responses to fire by soil, water, air, flora, and so on. The absence of biological agents reinforces the sense that, ideally, human agency should also be banned, at least for purposes of modeling. A physically-based science naturally proposes physically-based treatments, notably, stopping and starting ignition, and shoving biomass around.

There are good reasons to perpetuate this strategy. Yet there are compelling reasons to complement it, perhaps subsume it within a grander vision. It is possible, in particular, to turn the traditional conception of fire inside-out, as it were: to define fire as primarily a

phenomenon of the biosphere, subject to broad biological controls, with the well-known physical constraints internal and secondary to that frame. The justification goes like this. Fire is a creation of the living world. Life supplies its oxygen, life furnishes its fuel, and through ourselves, life kindles most ignition. Wind, lightning, drought, upper-level highs, El Niños, ridges and ravines - in the absence of life, such physical parameters constrain nothing but themselves. They exercise influence only through the medium of a biosphere that makes combustion possible and profoundly shapes its properties.

At every scale a suite of biological controls shapes how combustion's core chemistry behaves. From the level of molecules and cells to individual particles to landscape patches to the planet itself as an abode for fire - genetic, ecological, and evolutionary processes sculpt what kind of fire exists, when, and where. Pick almost any aspect of Earthly fire, and its biological character is fundamental; without life, fire would not exist. Moreover, a biological theory of fire would reserve pride of place to ourselves as uniquely fire creatures, the one species to claim a monopoly over fire's direct manipulation. It is only with humanity, in fact, that the circle of life nearly encloses the cycle of fire. Fire ecology, as presently conceived, would encompass only a fraction of a general theory of fire biology.

What might such a recontextualization do? Fire synthesizes its surroundings: it takes its character from its context. Turning that context inside-out - embedding fire within life - could ripple through how we understand fire and seek to manage it. A redefinition of fire as a subject would also allow for a redefinition of fire as a problem. At the level of everyday practice, much would remain the same. The intermix fire will still depend on simple, mechanical treatments. Fire in nature reserves will still reflect cultural choices. Firefighting will still resort to water, pulaskis, and retardants in an effort to break the chain of combustion chemistry. But new themes will also rise to the surface, and new techniques will emerge to exploit the ecological controls possible over fire. Fire management would mean integrated biological management. What might this look like?

A biological theory could, for instance, redefine prescribed fire away from simple hazard reduction. The point of burning is to ensure that fire does the ecological work demanded of it. A biological theory of fire would not ask how flame might reduce fuel, but how one might rearrange fuels to get the kind of fire a site needs. Hazard reduction would be a collateral benefit. (If all one wants is fuel reduction, there are plenty of techniques available.) Too often prescribed fire is an inverse of suppression, with mechanical control over flame and smoke the driving factors and ecological aims ancillary. Prescription burning becomes a kind of flaming woodchipper rather than an ecological catalyst.

A biological theory could recharter fire as a biotechnology, but one in which "control" depends on context. A candle is a tool as a hammer is. A controlled fire, however, may more resemble a domesticated species, like a sheep dog; this would be an apt representation of agricultural burning, for example. Or it may better approximate a captured ecological process, like a grizzly bear taught to dance (and ever on the edge of going feral). Truly biotechnological treatments must range beyond slashing and burning: fire synthesizes its surroundings, and whatever shapes those surroundings shapes fire. Fire becomes a kind of biotic defibrillator rather than a simple mechanical disturber, an ecological catalyst whose effects vary with the biotic medium that propagates it.

A biological theory could envision large fires as a necessity and an opportunity, not simply a flaming genie that must somehow be coerced back into its bottle. A physical theory of fire

frames the question in terms of control - of fire size and intensity, of suppression costs, of damages. It identifies what one must know to contain perimeter spread or the escalation of a surface fire into the crowns. Living ecosystems collapse into the virtual realm of fuel arrays. The implicit assumption is that such burns are escapes, broadly defined; that a proper organization could, in principle, contain them. A biological theory might invert this formula. It could accept that big fires are a norm for some landscapes and design fire programs accordingly. It might seek to understand what biological work is being done and what fire qua fire alone can do. An obvious strategy would be to kindle big burns deliberately, a program of prescribed stand-replacing fires. Instead of waiting for an escaped wildfire to blast through the canopies, it might make more sense to set big fires when conditions warrant, wresting the process away from arson, accident, and lightning's lottery. High-intensity patch burning might make an attractive alternative to the inevitable big fires raging under the worst conditions.

A biological theory would seek out the small as well as the big. It could promote fire as ecologically benevolent landscaping in places that have, until now, only sought its extirpation. Fire-gardening might be an acceptable alternative to mindless mowing and the application of chemical herbicides and pesticides - again, a catalyst in association with other practices, but often at a tiny scale, even a kind of bonsai burning. These patches might be small individually, but potentially large in their cumulative effects, much as creating an archipelago of wildlife habitats in and around towns can be. A biological theory of fire would suggest such sites as opportunities; a mechanical conception lashed to the needs of the public lands would necessarily overlook such fire niches or view them only as points of infection for fire escapes.

Perhaps most profoundly a biological theory would allow a place for ourselves as an ecological presence - in fact, as the biosphere's unique fire agent. Landscapes forged in anthropogenic fire would be the norm, and sites from which humans have chosen to absent themselves would become, properly, ecological outliers. The arguments for such a recentering - or refocusing, focus being the Latin word for hearth - are two, one theoretical, the other practical.

The theoretical case is that we hold a species monopoly over fire's manipulation, that we very nearly close the circle of life for fire's cycle. Other creatures knock over trees, dig holes in the ground, eat plants, hunt: we do fire. This is who we are as ecological agents. We may choose to remove ourselves from the scene in select wilderness areas, but this is our choice, not a natural state. Removing ourselves from theory, however, is nonsense. No one would argue that we ought to delete lightning since it complicates ignition rhythms, yet humans start many more fires than lightning. No one would suggest that we erase grazers and browsers from models of fire-frequented ecosystems since they muddy the fuel scene, yet people affect "fuels" far more than any other organism. A biological theory of fire demands a place for ourselves.

The practical issue is that fire ecology includes the flow of ideas and information as much as carbon, and that institutions structure landscapes as fully as mountains and seasons. Because humans are such powerful fire agents - starting and stopping ignitions, forever fiddling with fuels - the means by which they decide what to do powerfully influence how fire appears on the land. No comprehensive theory can ignore how we conceive of the world and our place in it, any more than a grand unified theory of physics can ignore gravity, however inconvenient to quantum calculations. People choose fire practices on the basis of what they

know, and they act on those choices through institutions. After the 1988 Yellowstone fires, for example, federal policy in the U.S. mandated that all public parks and forests submit their fire plans for review. Some places managed to revive a robust program, some did not. In the aftermath, strategies such as "prescribed natural fires" vanished from the scene. Landscapes far removed from the Northern Rockies thus felt the impact of Yellowstone's burns. This is as real as fire ecology gets.

All this suggests two other outcomes, again both theoretical and practical. The theoretical upshot is to reinforce ecology as a historical science, rather like geology. While models may be able to predict outcomes, if granted initial conditions, in reality those initial conditions are the idiographic product of past events. An ecological explanation for the working world must, of necessity, take the form of a history. Such a formulation allows for human agency. Whether people are amenable to scientific analysis or not doesn't matter, only that their past acts have shaped present landscapes.

Such a conception also creates a place for information. Ideas, data, beliefs - all these mold how people behave, directly with fire or indirectly with the landscape that fire must act in. Increasingly information is the power behind fire applications. For decades, fire management has resembled a commodity economy. More and more, however, it has morphed into a kind of service economy, for which information has become a medium of exchange. Although the likely prospect is that fire management must become more not less, intensive in the future, this need not simply mean more axes and pumps. It should mean denser data and contextual knowledge that can guide more specific decisions about particular places. Intensity of management may mean intensity of information.

Paradoxically - no, weirdly - contemporary fire science has no way to factor fire research into fire management. It fails to incorporate its own presence as an agent of ecological action. Fire science seems to exist as a kind of omniscient observer, capable of revelation when a funded project appeals to it, but otherwise not an indispensable process, as vital as browsers - thus another manifestation of our inability to put ourselves forthrightly at the core of fire's presence on Earth. If information drives fire management, then fire science must incorporate such information dynamics into its understanding of fire ecology, and hence must incorporate itself as a prime mover of fire. Such scholarship may exceed science's grasp; it should not extend beyond the reach of scientific theory. A robust biological theory of fire would insist upon it.

A biological theory would, finally, compel us to address industrial fire. This species of fire exists only because humans tend it, and it interacts with other varieties through the medium of human societies. Not least, it challenges the assumption that physical parameters are paramount. Burning - both of living and fossil biomass - is progressing to the point that it is perturbing the global climate. At its core, global warming is a question of combustion, and of people. Even climate can no longer be considered an absolute, a physical condition beyond the realm of anthropogenic fire practices to influence. This is no exhortation for a theory of Gaian fire: it is how the Earth as a fire planet works. A theory that cannot incorporate industrial combustion in an integrated way and that ignores the immense role of humans as fire creatures does not, in the end, hold much practical interest.

So we end where we began. There are lands with too much fire, and lands with too little. There are places with scrambled fire regimes. There is a planet slow-cooking in its combustion effluent. There is a creature with a species monopoly over fire, to whom almost

all aspects of the contemporary scene converge, like the focal point of a parabolic antenna. The Earth's fire scene is largely the outcome of what this creature has done, and not done, and the species operates not according to strict evolutionary selection but in the realm of culture, a moral universe of good and bad, knowledge and ignorance, belief and misperception; in brief, of confusion and choice. We are truly the weak link in the great chain of combustion, and the missing link in modern theories of Earthly fire. But whether the Earth ends as hearth or holocaust will depend on us.

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