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Fire in the mind: changing understandings of fire in Western civilization

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For most of human history, fire has been a pervasive presence in human life, and so also in human thought. This essay examines the ways in which fire has functioned intellectually in Western civilization as mythology, as religion, as natural philosophy and as modern science. The great phase change occurred with the development of industrial combustion; fire faded from quotidian life, which also removed it from the world of informing ideas. Beginning with the discovery of oxygen, fire as an organizing concept fragmented into various subdisciplines of natural science and forestry. The Anthropocene, however, may revive the intellectual role of fire as an informing idea or at least a narrative conceit.

This article is part of the themed issue 'The interaction of fire and mankind'.

'What is he doing there?'

'He is putting out the fire, your Excellency.'

'Not likely. The fire is in the minds of men and not on the roofs of houses.'

—Fyodor Dostoyevski, *The Possessed*

1. Kindling

In recent years, we have rediscovered fire as a natural phenomenon: we understand it as a fundamental component of the Earth System and as an ecological process at once ancient, essential and inevitable. We know fire only too well as a technology for producing power: with the firestick as a fulcrum we have managed to move landscapes and now the planet. Once, we also knew fire as an idea—as a concept, an element, an informing principle, a deity, a metaphor, an allegory, a creation story, etc. Increasingly, however, the fire in the mind has gone the way of open flames generally. It is suppressed, replaced or has gone feral.

Until the past century or so, fire was a near universal presence in human life. Working fires cooked, warmed, enlightened, entertained, worshipped and transmuted dross substances and landscapes into usable goods and habitats. Fire was everywhere. The first act of a day was to kindle a fire; the last act, to bank the coals; and in between, fire was a constant companion. Humanity's power was ultimately a fire power. Anything that so shaped their quotidian world would surely enter into people's understanding of that world and be abstracted into the world beyond.

And so it proved. Fire became as integral to the ecology of ideas as to that of the Earth. It did for knowledge what it did for wildlands and dwellings. It could rework thought as it did metal or clay. If it required explanation, it could also explain. Fire was the ultimate dialectical tool, capable equally of deconstructing the text of the world into its constituent parts and of fusing them into a new synthesis. The place the hearth held in a home, that the prytaeum held for a city, or a vestal fire had within a culture, intellectual fire had for the universe of ideas [1–3]. With it gods were manifest, about it myths were told, through it philosophy was explored and out of it a science evolved that would, in the end, deconstruct fire's magic, mystery and metaphysic.

2. Fire and mythology

Fire's power to destroy evil and promote good inspired stories, rites and ceremonies, all of which had their source in the authority of nature—in the rich ash of swidden, in fire-flushed pastures, in flame-pruned thickets lush with berries. So the phoenix immolated itself every 500 years and rose, young and vigorous, from the ashes. So Demeter sought to bequeath immortality on Demophöon, the infant son of her host, by placing him next to the hearth on successive nights. Repeated fire was, paradoxically, a means of perpetual renewal. It was a simple matter to decide that a similar logic governed the cosmos, that the world might begin and end with fire or enjoy immortality by passing through fire-induced cycles of death and rebirth [4–6].

The possession of fire was unique—this humans knew at their origins. More than anything else, fire defined them and segregated them from the rest of creation; myths that depict the origin of fire account equally for the origins of humans because the latter depended on the former. Typically, the proto-humans are helpless. Typically, some culture hero—a daring animal, a Titan, a cunning youth, a pitying god—steals fire from a potentate who hoards it as an expression, if not the source, of his own power. With fire, humans begin to act for themselves.

Within Europe there are many variants on the theme. No myth embraced all peoples. There was disagreement, for example, even within Greece. The Argives insisted that their ancient King Phoroneus had discovered fire, and well into the Pax Romana they continued to honour his memory with a sacred fire at the great temple of Apollo Lycius. Even the celebrated story of Prometheus varied according to the licence of poets and philosophers like Hesiod, Aeschylus and Plato. Preserved in writing, adopted by the dominant civilizations, the myth of Prometheus eventually became Europe's own.

According to Hesiod's *Theogony*, Zeus the Cloud-Gatherer hid fire from mortal man. He had, after all, fought for supremacy with the aid of lightning, and through lightning, fire. Flames had swept the Cretan battleground between the Olympians and the Titans like a tidal wave. But the Titan Prometheus, who had sided with the Olympians, sympathized with the pathetic humans, pilfered some of Zeus' heavenly fire and carried it to earth in a stalk of fennel—an herb often used as a slow match in ancient times, and possibly an echo of the reed that symbolized the Sumerian god of fire.

For this rash act Zeus punished both giver and receiver. To empowered man Zeus sent woman in the form of Pandora, whose mindless curiosity unleashed a host of evils. To Prometheus, rumoured to know the identity of him prophesied to overthrow Zeus, Zeus added cruelty to fury by chaining him to a peak in the Caucasus Range. Each day without fail an eagle would appear before the hapless Prometheus and devour his liver; each night the organ would grow whole again; daily, Zeus' rage smouldered and Prometheus' defiance swelled until after 30 000 or 40 000 years, Hercules arrived to break the chains. It was this version that Aeschylus explored in his famous tragedy, *Prometheus Bound*, and it was this vision of the rebellious culture hero that attracted the Romantics, who promoted a *Prometheus Unbound*.

Plato offered a more philosophical version. In the Socratic dialogue *Protagoras*, he described how the gods fashioned

mortal creatures from compounds of earth and fire, two of the world's four elements. Creation took place underground at the direction of Hephaestus, god of the forge, and Athena, goddess of the arts. Once the creatures had been rudely fashioned, the gods assigned Prometheus and his brother Epimetheus the duty of refining and delivering them to the surface. As the etymology of their names suggests, Prometheus could think ahead; Epimetheus, only after. When the time came to equip the created beasts with their requisite powers and functions, Epimetheus convinced his brother that he could handle the task. Foolishly, Epimetheus distributed the valuable but limited skills to the animals as they appeared. By the time humans arrived, there was nothing left. Since the day fast approached when they must disgorge the finished creatures to the surface, there was no time to rectify the bungled creation.

But Prometheus was friendly to humans, and he reasoned if humans had fire and the mechanical skills allied to fire, they could survive. Zeus' warders closely guarded the Olympian fire, so Prometheus stole into the workshop of Hephaestus and removed fire from the forge. (Hephaestus himself and his fire had descended from the heavens after Zeus had hurled him into banishment. In this way, the originating fire could trace its pedigree to lightning, not the forge.) Thus Prometheus could claim that he founded all the arts of men, and Plato could explain human dominance on the basis of pyrotechnology.

Regardless of particulars, the myths make clear that fire is power. It is not given freely, its presence joins humanity to nature, its possession distinguishes humans from the rest of base creation, and it unites the human with the divine. By cooking food, people got small guts and big heads [7]. By cooking landscapes, they went to the top of the food chain. And now that we have begun to cook planets we have become a geologic force. No wonder people went to extraordinary lengths to maintain eternal flames. Without fire they were nothing.

3. Fire and religion

The ever-preserved fire seemed godlike. In some societies, fire *was* a god; in others, a theophany, a manifestation of divine presence; in all, an inevitable part of sacrifice, ceremony and theology. The older the religion, the closer and more vivid the presence of fire, and the more ancient the fire god.

The Egyptian sun worship or Ra (or Horus) radiated fire imagery. The fire kindled daily on the altar re-enacted the rising of the sun; the flame in the temple was his expression, and the fire on the altar, the triumphal Eye of Horus. 'I am Horus, Prince of Eternity', read the Egyptian Book of the Dead, 'a fire before your faces'. New temples followed a consecration for which the torch was fundamental. Similarly, Ugaritic texts describe the dedication—purification—of Baal's temple with seven days of fire. Among Canaanite rituals to Baal and Moloch was apparently the sacrifice of burnt children, a practice condemned in Deuteronomy and Kings and by Jeremiah and reminiscent of the story of Abraham's near slaughter of Isaac. The terrifying messengers of Yamm before the council of El are depicted as a burning fire like a whetted sword, an image echoed in the Cherubim and flaming sword at the gate of Eden. Among the

Sumerian–Akkadian pantheon was Gibil, a fire god associated with cane and reeds, where no doubt he most often manifested himself. Gilgamesh sent burnt offerings, full of ‘sweet savour’, and the gods ‘gathered like flies over the sacrifice’. Holy fire was theophany, a means of sacrifice, and a weapon of divine wrath [8–11].

Early Indo-Europeans worshiped a fire god. He became Agni, the first of the Hindu pantheon; Svarozhich, a Slavic avatar; Atar among the early Iranians; the hypostasis of Ahura Mazda, the Great God of the Zoroastrians, among the first of the monotheisms. Greek and Romans divided the task among two gods, one of the hearth (Vesta) and one of the forge (Vulcan). For the Zoroastrians the fire ritual was a core ceremony, the perpetual fire a central obsession, and the pure fire an uncompromising obligation. For it they erected and consecrated temples; through it they made sacrifices. Their priest, the Magus, gave rite and religion a final form; the Parsees preserved both against challengers, even carrying the sacred fire to India; and the Hebrews, during their Babylonian exile, incorporated many features into their own beliefs and practices. Such awkward adaptations may explain, for example, the story of Nadab and Abihu, whom Yahweh destroyed with devouring fire for bringing ‘strange fire’—that is, impure fire, probably in the Zoroastrian mode—before the altar [8,12,13].

The Old Testament is in fact a cauldron of stories, rites, and beliefs simmering over a mix of religious fires. Probably, the early Hebrews possessed a fire god in their history, as the Indo-Europeans did Atar. Apparently, like many peoples, they carried fire with them. Abraham, for example, *brought* fire—not made it—as he prepared for the Moloch-like sacrifice of Isaac. If so, that fire god vanished. In its place, the Hebrews honoured fire as a manifestation of God, not as a god itself. Fire is, in fact, as John Laughlin confirms, ‘the oldest symbol with which Yahweh is associated in the Old Testament’. Many of these expressions seem ‘strikingly archaic’ to scholars, part of the Yahwist strata of the Pentateuch: Yahweh sealing the covenant with Abraham with a ‘smoking fire pot and a flaming torch’, echoing rites (including Akkadian) in which objects and persons are purified by passage between theophanic flames; Yahweh descending Sinai ‘in fire’ and appearing to Moses ‘in the flame of fire in the midst of a bush’, another covenant sealed with fire and another trope with analogues from Syria, Palestine and Egypt; Yahweh leading his people through the wilderness with a pillar of fire; Yahweh repeatedly speaking to his people ‘from the midst of fire’, a rekindling of the Sinai theophany. Prophetic reminders appear in Zechariah, Isaiah and Ezekiel, to whom Yahweh appeared as ‘the God of Fire’. The Psalms repeat the imagery; ‘the voice of the Lord flashes forth flames of fire’. In Daniel’s vision Yahweh claims for ‘his throne a flame of fire’, around which flows like a moat a river of fire. Deuteronomy (4:36): ‘Upon earth he showed thee his great fire; and thou heardest his words out of the midst of the fire’ [8,14].

To these sources the Priestly tradition added other images and rites—the altar fire, the fire from heaven as a means of accepting or rejecting ritual sacrifice, the perpetual fire as a manifestation of God’s immanence, the radiant fire as a symbol of God’s glory, the devouring fire as an expression of God’s power and anger; a plague, a weapon, a punishment, one of the most common motifs found in the Prophetic books. Fire—many fires of many origins to many purposes—blazes through the texts of the Old Testament.

Leviticus expounds the Priestly code for a perpetual fire, or holocaust as it must consume the sacrifice wholly:

The fire on the altar shall be kept burning on it, it shall not go out; the priest shall burn wood on it every morning, and he shall lay the burnt offering in order upon it, and shall burn on it the fat of the peace offerings.

Such a practice had ample analogues among the Canaanites, the Greeks and the Zoroastrians, whose ceremony parallels the Hebrew one closely. The Philistines, the Sea People, may in fact have descended from Greeks with a special worship of Hestia, the goddess of the hearth. It is worth remembering that even as they began their Babylon captivity, according to Maccabees (II 1:19), ‘the pious priests of that time took some fire from the altar and hit it in a pit’ in the hope that it might continue and be revived in the future. Nehemiah later rekindled the fire, apparently extracting with sunlight from ‘naphtha’. The restored fire burned on the altar of the restored temple until Roman soldiers razed—by fire—the temple itself in AD 70 [8,9].

The success of the fire or the behaviour of its smoke manifested the reaction of God to the ‘burnt offerings’ presented by supplicants. The most spectacular exchange involved the infusion of direct fire from God himself. ‘Fire from heaven’ consumed the troubled sacrifice of Manoaah, decided the contested sacrifice at Mount Carmel, accepted the offerings of David at Ornan, and filled the Solomonic temple during its dedication with the ‘glory of the Lord’. The threat of punishment through divine fire—of Israel for its iniquities, and of Israel’s enemies for their hostility—is so common that it became ritualistic, evolving into a literary formula that, because it quoted so often from Jeremiah, became known as the jeremiad.

The Bible’s fire tropes have their history. The oldest images associated fire with lightning—the smoke, fire and storm-spewed lightning that descend on Mount Sinai. But most fire images derive from landscapes no longer wild. Wilderness fire was already a distant memory, a cultic cliché. More vivid metaphors, those with the power to speak to the prophet’s society, came from agriculture and pyrotechnologies—the burning of stubble, old vines and weed thorns; the assayer’s and refiner’s fires; the fires of furnace and oven; the wasting fires of warfare. Even more abundant are allusions to altar fires and incense. (Even the pagan *Aeneid* constantly recounts sacred fires lit, saved and extinguished, the inevitable accompaniment to any sacrifice or ceremony.) These are the tropes of urbanites, the fire metaphors of intellectuals removed from routine anthropogenic burning, of priests obsessed with symbolism, ritual and formulaic idiom. As the universal fire was further parcelled, packaged and specialized, it lost its power as a metaphor of the universal [8,15,16].

Christianity continued the metaphoric sublimation. It shed the final vestiges of the fire sacrifice, much as Buddhism did the fire ceremony of Hinduism. The altar fire shrank into the votive candle, and burnt offerings into the sweet fumes of incense. The routine wrath of Yahweh’s fire visitation receded into the hallucinogenic apocrypha of a final conflagration. If the Last Judgement resembled the burning of tares, as Matthew likened it, this was a mild vision compared with the melting of mountains and the jealous fury that rained down ‘fire and brimstone’ on Sodom and Gomorrah. The tongues of flame by which the Paraclete was manifested above the Apostles was a pale shadow of Baal’s fiery

messengers before which even the ‘gods do drop their heads, down upon their knees’ [8].

4. Fire and natural philosophy

Secular philosophers, too, appealed to fire as a universal principle, either one of the founding elements or the process by which the elements came to life. What happened in religion occurred also with natural philosophy. Fire as a phenomenon required explanation, and fire as a tool offered, in various ways, a means of explanation. Between theology and philosophy there was overlap; but it was obvious that fire existed apart from any divine agency, that the hearth and furnace were as central to the house and shop as the altar fire was to the temple, that an understanding of fire was mandatory for any improvement in the arts of field and forge. But from that exalted origin, fire endured a declension in philosophical status similar to that it experienced in theology.

Certainly, fire was an obvious subject for contemplation. Wherever there were people, there was fire; whatever change people wrought in the world, they did with fire. Anyone could see that fire was fundamental to the world and essential to any process of change. Was it not fire that transformed woodland into garden, clay into pottery, ore into swords? Whether, as Gaston Bachelard concluded, the hearth fire ‘was no doubt for man the first object of reverie’, it was certainly an object of inquiry. Around campfires, before hearths and beneath candles people talked, children learned, scholars read, poets sang [2,17,18].

For early Ionian philosophers like Herakleitos of Ephesus it embodied the essential principle of change: ‘all things are an exchange for fire, and fire for all things’; ‘this world . . . was ever, is now, and ever shall be an ever-living fire, with measures of it kindling, and measures going out’. (Not for nothing was he known as Herakleitos the Dark). As Diogenes Laertius explained the later Theophrastean doxography, the world itself ‘arises from fire, and is consumed by fire alternately through all eternity in certain cycles’, culminating in a ‘final conflagration’. Very likely Herakleitos, like Hebrew theologians, felt the influence of Zoroaster. Others opted for different informing principles—Thales for water, Anaximander for air [2,17].

But fire claimed as central a role in thought as it did in the house; most ancient philosophies, Chinese as much as Greek, credited fire as an element. Anything emanating heat, light or change (or for humans, passion) could be subsumed under the doctrine of a universal fire. The analogies to life were particularly powerful. That fire ate (feeding on *pabulum ignis*), grew, decayed, breathed and died seemed to emulate the cycle of living beings. Plutarch believed that the ancients respected fire because it resembled animals and indeed because they imagined close analogies between fire and themselves. But any philosophy of natural change—the core of chemistry—had to explain fire and most often exploited fire as a model. ‘If all that changes slowly may be explained by life’, Bachelard concluded, ‘all that changes quickly is explained by fire’ [2].

Certainly, the great schools all played with fire as an intellectual tool if not a cosmogenic obsession. Zeno cantered the natural philosophy of Stoicism around the doctrine of an essential fire. A Greek successor, Diogenes Laertius, summed up Nature as ‘an artistically working fire’, a

phrase Cicero repeats in *De Natura Deorum* and a metaphor undoubtedly derived from the authority of pyrotechnologies. (It was Cicero who famously observed that, by their artifice, humans had transmuted raw nature into a ‘second nature’. Pliny the Elder showed how: ‘At the conclusion of our survey of the ways in which human intelligence calls art to its aid in counterfeiting nature, we cannot but marvel at the fact that fire is necessary for almost every operation’. Fire transformed clay into brick, limestone into cement, ore into metal, sand into glass—and on and on.) As fire animated the corporeal world, so the ‘fiery breath’, the soul, animated the body. The cycles of fire informed even time, as history beat to the rhythms of world-ending and world-renewing Great Fires [17].

The majority of philosophers followed the example of Empedocles, who orchestrated the competing principles of the Ionians into four elements (or ‘permanent roots’)—earth, air, water and fire. The Pythagoreans placed a ‘central fire’ (different from the sun) in the middle, while around it the 10 basic bodies including the Earth revolved. Plato accepted the four elements, and elaborated the scheme in such dialogues as the *Protagoras*, *Phaedo* and *Timaeus*, his creation story. His enduring contribution, however, was a critical passage in *The Republic* in which he describes the human condition through what has been known ever since as the Allegory of the Cave. We are like slaves chained in a cave. All we see—all we can know—is what the flames of torches behind us throw into their treacherous light. We see only the shadows of objects that pass behind us, not the objects themselves. Compared with the pure sunlight outside the cave, firelight is a poor facsimile, offering an illusion of knowledge. The goal of the philosopher is to break those fetters and pass through the shadows to truth [17,19].

But for most philosophic schools, the world lit only by fire was the real world, and an explanation of fire was mandatory to understanding how that universe functioned. The torch, so to speak, passed to Aristotle, who accepted the Empedoclean four elements, identified them with the four primary qualities (hot, cold, dry, moist), organized them into the four sublunary spheres and arranged them into dialectical couplings. Vergil put it into verse in his Sixth Eclogue:

He sang how in the mighty Void, the seeds of Earth and of Air and of Ocean, and of Fire—that pure thing—ranged themselves together; and how from these principles all the Elements arose, systematically cohering in the tender globe of the World.

As always, fire was the odd element, the least tangible but also the most vital and the most protean. If it did not inform the material world, it was the model for chemical change—and would remain so into the nineteenth century.

But the authority of Aristotle was immense. His student, Theophrastus, wrote a monograph on fire (*De Igne*), in which he affirmed that ‘of all the elemental substances fire has the most special powers’ because only fire is self-generating. Few of the ancients ignored the Aristotelian canon; Pliny announced, with considerable exaggeration, that there were no dissenters from the Aristotelian doctrine of the four mutable elements. And all those who studied fire, Aristotle and Lucretius among them, were mesmerized by the common spectacle of the erupting flame. Fire was something that escaped during burning, or if not fire, then some equivalent inflammatory principle. If fire did not explain itself, then some other explanation was necessary; but until natural philosophy could account for fire it was

worthless as a discipline, for it was through fire—*philosophus per ignem*—that philosophers, alchemists, smiths and smelters worked their transmutations [20,21].

By the late Renaissance the intellectual pillars of the old order were crumbling. John Donne might retain fire's metaphoric power:

Fire ever doth aspire
And make all like itself,
turns all to fire

But he also recognized a shift in the deeper status of fire as a generic principle of explanation as the early tremors of what would become the scientific revolution were felt.

And new Philosophy calls all in doubt,
The element of fire is quite put out.

Paracelsus reduced the four elements to three (*tria prima*) and established one of them, 'sulfur', as the principle of combustion. Others recombined elements, and found equivalents for 'fire' in sulfur, oils, phlogiston or caloric—something that could escape as flame, smoke, heat and light. In his *Sceptical Chymist* (1661), Robert Boyle noted how the Aristotelians still relied on burning wood as a model system. 'The escaping fire in the flame, the smoke returning to its aerial source, the water boiling off from the sizzling end and the residual ashes', as Joshua Gregory summarizes, 'seemed to embody the traditional four elements' [18].

In 1720, Hermann Boerhaave re-established the supremacy of fire by announcing that 'if you make a mistake in your exposition of the Nature of Fire, your error will spread to all the branches of physics, and this is because, in all natural production. Fire... is always the chief agent'. Pierre Macquer's *Dictionnaire de la Chymie* (1766) lamented the persistence of Aristotelian chemistry. In his *Philosophical Inquiry into the Cause of Animal Heat* (1778), Dr Patrick Dugud Leslie resolved the 'chymical analysis' of living matter into water, earth, air and phlogiston—the latest fire surrogate [2,22].

In fact, the Enlightenment was full of residual fires. Earth had its central fire, the solar system its solar fire, the heavens the celestial fire of the stars, comets and quintessential aether. Electrical fire discharged as lightning. Inner fire provided the life force for plants and animals, the source of animal heat. Eccentrics like Athanasius Kircher could organize the planet according to its pyrogeology, even if fire had morphed from an informing principle to an organizing one. And of course there was the ever-fascinating fire in the machine. Even Lavoisier's discovery of oxygen only replaced one fire principle, phlogiston, with another, the caloric. When in the mid-nineteenth century Michael Faraday wanted to demonstrate the principles of natural philosophy, he chose, on ancient precedent, fire for his subject. 'There is not a law under which any part of this universe is governed which does not come into play and is touched upon in these phenomena' [22,23].

But Faraday's *Chemical History of a Candle* also helped complete the intellectual transmutation of fire, its devolution from a universal cause to a chemical consequence, the mere motion of molecules, the quantum bonding of oxygen. Fire illustrated principles: it was no longer itself a principle. Bachelard might boast that he 'would rather fail to teach a good philosophy lesson than fail to light my morning fire', but most philosophers no longer lit fires or cared to understand them beyond their shared domiciles. The American

Ben Franklin, for example, tamed 'electrical fire' through his lightning rod, caged the wasteful hearth fire into a metal stove and devoted his philosopher's mind to electricity rather than the elemental fire [2].

Out of sight, out of mind. As technology caged and removed fire from everyday contact, as it found means to burn lithic landscapes rather than living ones, so fire faded from the visions of natural and other philosophers. This intellectual transition occurred, not incidentally, alongside fire's condemnation by agronomists and foresters, with its removal as a vital force in urban life, and therefore in the felt life of the intellectuals who resided there, and with the challenge posed to its role as a foundational technology by the industrial combustion—the burning of fossil fuels in special chambers. Thomas Carlyle might exclaim that 'the power of fire, or Flame... we designate by some trivial chemical name, thereby hiding from ourselves the essential character of wonder that dwells in it as in all things... Flame is a wonder. What is Flame?' But most of his contemporaries were moving on, probably by rail and steam, for which flame was hidden, and they carried their new understanding of the world in their portmanteaus [24].

That, in cameo, is what happened across Western civilization. Modern science reversed the ancient syllogisms and similes that had bound humans and nature. Ancient fire practices had mimicked nature; now technology provided the model for how nature worked, or ought to work. Not flame but the heat engine was the exemplar for animal metabolism and the source of inspiration for how heat was created and transferred. Natural philosophy found conceptual surrogates for fire. Chemistry subordinated fire to the atomic bondings of oxygen. Thermodynamics segregated fire from motion and heat. Electromagnetic theory divorced it from light. The concept of energy replaced the universal suffusion of fire throughout nature. Fire shrank from Heraklitean universality to the laboratory demonstration of Faraday's candle.

In Heraklitean times, Aeschylus could write *Prometheus Bound*, which left the Bringer of Fire chained to the Caucasus by higher powers. So was fire also bound by the larger shackles of ecology and climate. As powerful as it made humanity, it could not allow people to transcend the grand logic of nature. In 1820, when Percy Shelly wrote *Prometheus Unbound* and made the unrepentant Titan a cultural hero for an emerging Romanticism, the new pyrotechnologies were allowing humanity's power to move beyond the rhythms and biotic fetters of earlier eras. Increasingly, open flame would be viewed as a ceremonial relic or badge of primitivism, still bound by the chains of superstition and habit.

Once the manifestation of gods and the source of life—the most familiar of nature's Others, the most basic of tasks—fire had become alien, a destroyer of cities, a savager of soil, a befowler of air, an emblem (in science as in agriculture) of the hopelessly primitive. Whether or not they had broken humanity's chains, philosophy and modern science successfully extinguished the allegorical flame in the cave. Other devices now illuminated the cavern; psychology replaced nature as muse, and machines, nature's models. Once an informing metaphor, philosophical fire had become a cliché, fit only for humanist scholars and the garish covers of romance novels.

But the world cave had housed more than humans, and fire had forms other than torch and hearth and purposes other than poetry and politics. Fire had come from nature,

and unless humans utterly remade every particle of the Earth, nature's fire would persist—as it must necessarily persist in any theory of ecology; and as it had to persist for any philosophy or history that sought to explore the relationship of humans to the Earth. Fire was not arbitrary, its ecology not replicable, its meaning not expungeable. However uncertain its light, however, compromised its flame, fire illuminated the world as it was. If the cave's fire was a poor facsimile of the Good, the True and the Beautiful, so was the humanity that tended it.

In retrospect, it seems fire held on so long as a principle because it was so basic to human experience that it seemed it must be equally elemental to nature. But among those ancient elements fire was the odd man out. Earth, air, water, all are substances. Fire is a reaction that synthesizes its surroundings: it was what allowed the others to move and mix. Our sense of its presence was so tangible, however, as to suggest that fire must also be ponderable, that like the other elements it must involve a substance, however, invisible to sight. So fire passed through a series of intellectual reincarnations, as phlogiston (the *principle* of Inflammability), as caloric, even as aether. Now even that ethereal sense of it as a medium has vanished [22,25].

In nature fire is a shape-shifter, taking its character from its context. And so it has proved as an object for inquiry, parcelled out among the established disciplines. Today the other elements have their own academic departments to further their study, but the only fire department on a university campus is the one that sends emergency vehicles when an alarm sounds. Our combustion habits may be changing Earth's climate but they have yet to alter the climate of opinion about the place of fire on the Earth or in our understanding.

5. Fire and European norms

Of course fire could not disappear completely. Humanity's reach might be vast but its grip was less sure. Farmers continued to fire fallow, pastoralists to burn pastures, and nature reserves, which stood outside the industrial transformation, burned as before. What to make of these fires?

With few exceptions they were condemned. Agronomists detested fallow and loathed the fires those waiting combustibles inspired. The Enlightenment established fire as the dividing line between the primitive and the progressive. Primitive farmers and herders used fire; progressive agriculture found alternative ways to fertilize and fumigate. Foresters hated and feared fire, and the migratory peoples who used them, and they made the condemnation of open burning a badge of their self-proclaimed profession. Temperate Europe, the heartland of forestry, declared itself the norm for ordering and understanding nature; and since it became the metropole for modern science, for new-combustion technology, and for European imperialism, it spread those ideas throughout the world. Of particular consequence Britain and France, most notably, and the Netherlands, Russia, and later Germany turned over the administration of forest reserves and other institutions of state-sponsored conservation to foresters [1].

It was a fateful decision. The heartland of forestry knew fire only as a human artefact, not a natural process. When its emissaries became the satraps of empire, overseeing

estates as large as some European countries, they made fire protection a foundational doctrine—a precondition to 'rational' land use. Most new lands were burned lands. Since places like India, Cape Colony, Kenya, Ghana, Cyprus, North Africa, Australia, Canada—nearly everywhere foresters went—overflowed with flames, the agencies found themselves in a continuous firefight. It helped that the industrial transformation, by spurring logging and land-clearing colonizers, added to the bonfires. Fire became a political as well as practical challenge.

The upshot has generally been disastrous. Rarely was it possible to abolish burning, but even the attempt was enough to unsettle biotas and destabilize the fire regimes that had previously supported them. The fire practices and the lore that had sustained the old order were suppressed along with the flames. In some places the effects were felt within a handful of years; in others, over decades. But any place that underwent regular rhythms of wetting and drying felt the impact. A kind of ecological dry rot set in. Once abundant but benign fires went feral. For the past few decades major efforts by the agents of state-sponsored conservation have sought to distinguish good fire from bad and to restore good fire in order to enhance ecological integrity and reduce the unruly fuels that feed a growing population of conflagrations.

This global project had intellectual consequences as well. As fire faded from fundamental disciplines, it moved into forestry. It became ghettoized, an applied field, subordinate to the precepts and political economy of foresters. For most of the twentieth century what was known about landscape fire came from a group committed to its control and eventual extinction. As a topic, free-burning fire continues to struggle to reclaim a place in major disciplines like biology. Now, as wildfires break out of preserved wildlands and begin to encroach onto the urban fringe, fire seems to be pushing into fields that had previously ignored it.

6. Fire and the Anthropocene

So in ways no one might have predicted, and more by stealth than by overt argument, fire is returning to prominence as a phenomenon, a problem, and a principle, and into what may evolve into a creation story for our time. The reason is the cascade of global changes for which the term Anthropocene serves as shorthand. Thanks to industrial combustion, humanity has become a geologic force. By burning past landscapes on an immense scale it is shaping future landscapes. From a topic rudely quarantined into forestry or applied engineering, fire on the Earth has become a scientific subject of accelerating interest, a political issue of international scope in the form of climate change, and a public concern as a recurring and perhaps chronic disaster.

What is lacking is a schema to join this farrago of evidence, ideas, theories, and images into something like a coherent system or at least a collective narrative. That requires a sense of intellectual urgency, not just ambulance chasing after trends and funding. Let me suggest two themes to pursue to this end.

One is the understanding of fire as a biological construct. We continue to define fire as a problem of physical chemistry. The reduction of flame into oxygen reactions and heat transfer is, after all, how we managed to create all those

marvellous machines that largely power our world and act as catalysts for technology generally, a force multiplier for whatever we do. Our environmental power is a fire power. By changing our fire practices, the planet's keystone species for fire has rewired the combustion circuitry of the biosphere.

However much the process has enhanced human economies, it has unhinged nature's. It has scrambled the erstwhile rhythms of fire and life. The old order of burning came with ecological boundaries: burning had to occur in seasons and under conditions that reconciled biological imperatives with climate. The new order can burn day and night, winter and summer, through drought and deluge, ice age and interglacial. In the old order fire history was largely a subset of natural history, particularly of climate history. In the new dispensation natural history, including climate, is becoming a subset of fire history.

In the old order the technological problem was to increase combustion—to find more to burn, more efficient ways to burn it, and better means to extract heat and light from flame for human ends. In the new order the problem is more and more that we are burning too much of lithic landscapes, well beyond the capacity of the Earth System to absorb, and too little of living landscapes, so that the regimes to which ecosystems had adapted are as unmoored as their prevailing climates. The problem is not simply physical—overloading the atmosphere with greenhouse gases—but biological. There is too much of the wrong kind of fire and too little of the right kind. This loss of ecosystem goods and services, of usable habitats in the largest sense, is not merely the outcome of climate change induced by combustion but of the simultaneous removal of fire from landscapes that need them.

Our dominant understandings of fire allow us to explain the former but not the latter. For nearly all ecological science, until very recently, fire has remained a physical, exogenous force that impacts upon landscapes. It does not emerge from the very character of life, is not a property inherent in life on the Earth, though its reaction is among the most fundamental to life, for it takes apart what photosynthesis puts together. This reduces us to discussing landscape fire in terms of fuel and climate, and to imagine our responses in terms of physical countermeasures. Still, the appreciation grows that fire is a natural process that is as fundamental to ecosystems as rain and sun. What has not yet happened is a gestalt-like toggling in the mind that would conceive fire as not merely endemic but biologically constructed; life creates the oxygen, life creates and shapes the fuel, life in the form of humans provides most of the ignitions. Refounding our understanding on fire as not simply a process in the living world but an emergent product of it, we might conceive of remediations that do not rely on shoving blocks of hydrocarbons around, waiting centuries until the atmosphere purges itself of excess combustion products, or discussing biodiversity and habitat health in terms of fuel loads and fire-sheds. Fire is a creation of the living world. We need a theory that rises out of that fact [26].

The second theme is a narrative to explain this new orientation. Like all stories it requires a protagonist, and for this story, the protagonist is us. But putting ourselves at the centre of our own narrative can also be disruptive. It means we have to move beyond natural science into other scholarships and even into literature. Worse, the teller of the tale is an inherently unstable source. Unreliable narrators,

however, are a fixture of the modernist canon. A narrative of the Anthropocene will require a self-reflexive style that will seem alien to those who only see the topic as fit for science or political activism. It may be a text version of a Möbius strip [27].

But we do not need to engage a high-modernist perspective. We can split the ancient saga of fire and humanity into two variants—working narratives, as it were. One is the promethean story. It speaks of fire as technological power, as something abstracted from its old setting, perhaps by violence, and certainly held in defiance of an existing order. This is fire as simple combustion, sustained by boundless reserves of fossil fuels. So much burning is now occurring, and will probably accelerate, that it is reconstituting the Earth's biosphere, even as its effluents unhinge the planet's climate.

The other story is a more primeval tale that speaks to fire as a companion on our journey, as a shared bond with the living world we inhabit. It stresses our role as a steward, the keystone species for fire. It speaks to our presence as a uniquely fire creature on a uniquely fire planet. It notes that our failure to keep good fire on the land is destabilizing the Earth as much as our promotion of bad fire. Even wildfires are becoming less feral than rabid. We have created too much of the wrong kind of fire, too little of the right, and too much combustion overall.

It would be good to join these two working plots into a grand narrative, in the same way that it would be nice to combine various working hypotheses into a general theory of the Anthropocene. At present, though, the two variants of anthropogenic fire—burning lithic landscapes and burning living ones—are not reconciled. They are not even recognized as the two poles of an alternating current that has powered humanity's rise [28,29].

But if it were to happen, if the coming fire age became recognized as a Pyrocene, if a global change occurred in how we connect the various concepts and disciplines so that they align with the reality of the world that is coming into being, it could underwrite a creation story for the Anthropocene. It would again put our firepower at the core of what it means to be human on the Earth. We need such a narrative. The world we experience is the world around us, but the world we know and the world we act on is the world in our head. To paraphrase Dostoyevsky, the fire that ultimately matters is not the fire on the roof or in the bush or in the dynamo, but the fire in the mind.

7. Meeting discussion

Toddi Steelman (University of Saskatchewan, Canada): The military has been used as a metaphor in wildfire response. What alternative metaphors could we use to reshape our relationship with fire?

S.J.P.: There are two general metaphors in play. One is fire as disaster. This has some validity: fires in built environments, municipal watersheds, and amid rare, fire-intolerant ecosystems *can* be disasters. But most wildland fires are not. The other metaphor is the firefight as battlefield. This is both inaccurate and damaging. If, in fact, we are at war with fire, three things will happen. We will spend lot of money, we will take a lot of casualties and we will lose.

But it has proved very difficult to create compelling alternatives. The crux may be literary, that a story hinges

on characters and conflict. The point of alternative fire metaphors is to avoid conflict, to redefine our pact with fire as a symbiotic relationship, of which many metaphors are possible from a three-legged race to a Faustian bargain, but which do not depend on conflict in which there is a moral pivot. My best guess is that we will not create a new metaphor. To borrow an allusion from firefighting, we need to shun direct attacks and go indirect. A great movie or novel about fire will not be about fire directly, but about a gripping human drama for which fire furnishes a context. (Think *Chinatown*, in which water provides the back story.) More broadly, the industrial world has largely relinquished its personal connection with fire, so fire appears as a virtual reality, not as a source of fresh metaphor. I think a tale of the

Anthropocene as a Promethean misadventure could work for rallying sentiments against bad fire. But crafting a narrative of good fire? It is the problem Renaissance writers faced: how do you remake pagan epics into Christian literature? Milton's *Paradise Lost*, with its defiant Satan, is more compelling than *Paradise Found*, with its redeemed but meeker Christian hero.

The larger issues would not be solved by science alone. Science creates data; the arts, religion, the humanities—these create meaning. Narratives and metaphors, art generally, must be part of any effort at remediation.

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