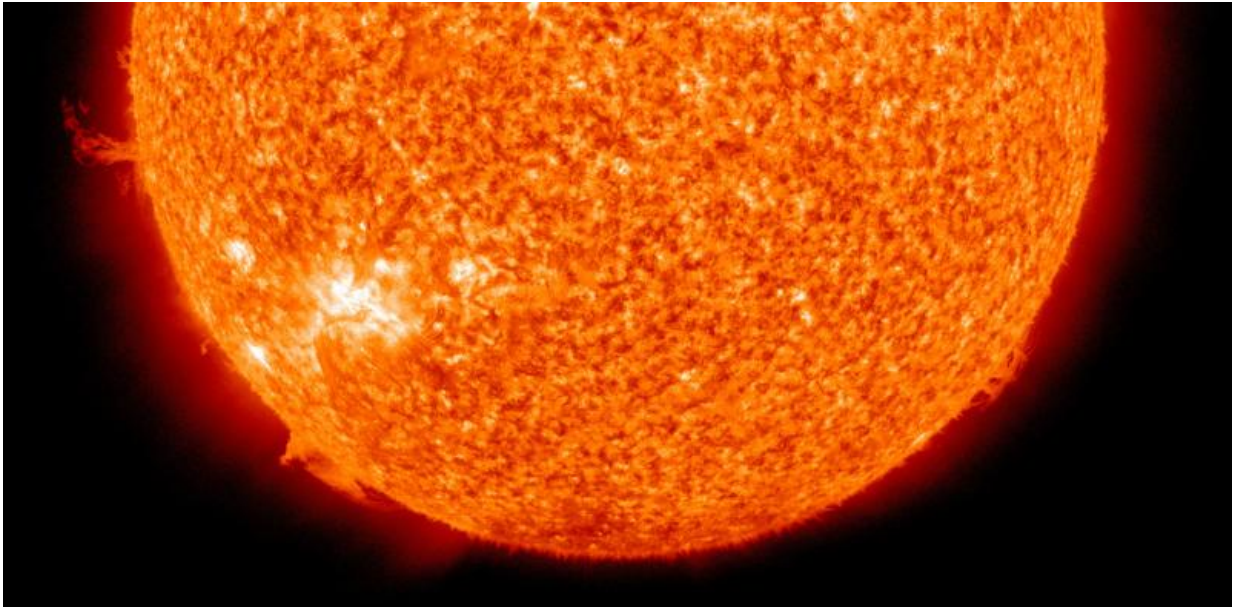


# Before fusion—a human history of fire

April 22 2016, by Stephen Pyne, Arizona State University

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Hydrogen is built into helium at a temperature of millions of degrees. Credit: NASA/SDO (AIA)

We humans are fire creatures. Tending fire is a species trait, a capacity we alone possess – and one we are not likely to tolerate willingly in any other species. But then we live on Earth, the only true fire planet, the only one we know of that [burns living landscapes](#). Fire is where, uniquely, our special capabilities and Earth's bioenergy flows converge. That has made us the keystone species for fire on Earth. Our environmental power is literally a [fire power](#).

We developed small guts and large heads because we could [cook food](#). We went to the top of the food chain because we could [cook landscapes](#). Then we went from burning living landscapes to [burning fossilized, lithic ones](#) and became a geologic force that has begun to [cook the planet](#). Our firepower underwrites that tangle of anthropogenic meddlings summed up as "global change." The [Anthropocene](#) might equally be called the [Pyrocene](#).

The Pyrocene threatens to overwhelm Earth with fire as the Pleistocene did with ice. It has forced us to reexamine the nature of our firepower, which has taken two forms. One involves open burning on the landscape. We tweak natural fire regimes to better suit our purposes. We set fires for hunting, foraging, protection against wildfire, even warfare. We burn slashed woods and drained peatlands for farming. We kindle pastures to improve fodder and browse. We burn fallow, of any and all kinds. Over the past century we have sought, with equal intensity, to [remove fire](#) from protected forests and parks. The pyrogeography of the planet is sculpted by the fires we apply and withhold, and the landscapes we have fashioned, which in turn shape the fires they exhibit.

Our other firepower comes from closed combustion. We put fire into special chambers – hearths, forges, furnaces, engines, candle wicks, dynamos – to generate light, heat and power. These mechanical keepers of the flame have enormously leveraged our firepower. Matthew Boulton, James Watt's business partner in promoting the steam engine, put it with [brutal pithiness](#): "I sell here, sir, what all the world desires to have – Power."

As fire industrialized, as biotas, terrain, air and lightning were disaggregated and refined into [fuel, oxygen and spark](#) to produce maximum effects, fire began to vanish from daily life and landscapes. The two narratives of fire – open and closed – once overlapped. We domesticated landscapes by passing the equivalent of the hearth fire over

them. Now we use closed combustion to substitute for or suppress outright those free-burning flames.

## Shifting our understanding of fire

Today, as [measured by emissions](#), even allowing for the massive incineration of tropical peat in Indonesia, we burn far more by closed combustion than by open. Particularly in urban and industrial societies, more and more combustion comes from confined fires than from open flames on landscapes. In modern cities [free-burning fire](#) is progressively banned, even for ceremonial purposes. The [Burning Man](#) festival had to [relocate](#) from San Francisco's Baker Beach to Black Rock, a salt playa in Nevada. Candles are [banished](#) from university dormitories.

Most of humanity's fire history has pivoted around a quest for combustibles, for new and more abundant sources of stuff to burn. As we exhausted one cache of combustibles, we moved to another, eventually drafting fossil biomass from the geologic past. Slash-and-burn agriculture is an apt metaphor for humanity's fevered quest for fire generally.

Now we face a question of sinks – of the capacity of ecological systems, including Earth itself, to absorb all the effluent. So, too, our understanding of fire's place in planetary history is inverting. We used to understand fire as a subset of [natural history](#), particularly of climate. Now natural history, including climate, is becoming a subset of fire history.

## Leaving behind Promethean fire

The open and closed narratives of fire, once linked, have diverged. The story of closed combustion is [Promethean](#), stolen from the gods and

brought under human control. It speaks to fire abstracted from its setting, perhaps by violence, and certainly held in defiance of an existing order. Promethean fire provides the motive power behind most of our technology.

The narrative of open burning is a more primeval story that speaks to fire as a companion on our journey, as part of how we exercise stewardship of our natural habitat. We are the agent that brokers fire for the biosphere, who more than any other organism shapes the patterning of fire on the land.

Overall, thanks to Promethean fire, we now have too much of the wrong kind of fire, and it has led to a quest for alternative forms of energy that do not rely on combustion. The move toward carbon-neutral energy promises to unbundle the source of our power from our grip on the torch. Recent developments in [nuclear fusion](#), which has long promised a full replacement for burning, have [inspired calls](#) for a "[Wright brothers moment](#)" to show the world what is possible. Together fusion and [solar power](#) promise to replace the human need for controlled flames, to decouple Promethean from primeval fire.

Such is the power of fire in our imagination, however, that we continue to speak loosely of such alternatives as "fire," as earlier times lumped together all natural phenomena that radiated heat and light. Well into the 18th century, the Enlightenment saw central fires in the Earth that boiled over as [volcanoes](#), [celestial fires](#) in the guise of stars and comets, solar fire blazing from the sun, electrical fires crackling as lightning. Fire was, and remains, a potent source of metaphor.

But fusion and solar power are not combustion. They represent a decarbonization of energy to the point that it is no longer fire. We can all breathe easier (literally) when Promethean fire shrinks, and perhaps vanishes.

## Returning fire to nature

That still leaves primeval fire, an emergent property of the living world that has flourished since the first plants colonized continents. It will not go away. Rather, its removal, even its attempted removal, can be profoundly disruptive. We need a lot more primeval fire of the right sort. Paradoxically, the more we find surrogates for closed combustion, the more we can embrace [open burning](#).

We have to sort out good fire from bad. That's exactly what our species monopoly makes possible and what our firepower demands of us. We can begin by reversing the Promethean story, by taking fire out of our machines and putting it back into its indigenous setting. Faux fires like solar power, nuclear fission and fusion can nudge that project along by taking its place and fulfilling our modern energy needs. A triumph of fusion energy won't mean the end of [fire](#). It will simply liberate it from its enforced captivity and relocate it into [landscapes](#) where it can do the [ecological work](#) that it alone can do.

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