

# ‘A deranged pyroscape’: how fires across the world have grown weirder

<https://www.theguardian.com/environment/2022/feb/03/a-deranged-pyroscape-how-fires-across-the-world-have-grown-weirder>

Despite the rise of headline-grabbing megafires, fewer fires are burning worldwide now than at any time since antiquity. But this isn't good news – in banishing fire from sight, we have made its dangers stranger and less predictable

by **Daniel Immerwahr**

Thu 3 Feb 2022 06.00 GMT

# T

he hundreds of bush fires that hit southern Australia on 7 February 2009 felt, according to witnesses, apocalyptic. It was already hellishly hot that day: 46.4C in Melbourne. As the fires erupted, day turned to night, flaming embers the size of pillows rained down, burning birds fell from the trees and the ash-filled air grew so hot that breathing it, one survivor said, was like “sucking on a

hairdryer”. More than 2,000 homes burned down, and 173 people died. New South Wales’s fire chief, visiting Melbourne days later, encountered “shocked, demoralised” firefighters, racked by “feelings of powerlessness”.

Australians call the event **Black Saturday** – a scorched hole in the national diary. There, it contends with Red Tuesday, Ash Wednesday, Black Thursday, Black Friday and Black Sunday on Australia’s calendar of conflagration. But recently it has been surpassed – they all have – by the **Black Summer**, the cataclysmic 2019-20 fire season that killed hundreds with its smoke and burned an area the size of Ireland. A study estimated that the bushfires destroyed or displaced **3 billion animals**; its stunned lead author couldn’t think of any fire worldwide that had killed nearly so many.

This will keep happening. As the planet heats, combustible landscapes will dry and ignite. Less fire-prone lands, such as Greenland, will start catching fire, too. Environmentalists now **urge us to imagine** the whole world aflame. If our old picture of climate breakdown was a melting glacier, our new one is a wildfire. Its message is simple and urgent: the higher we crank up the heat, the more everything will burn – call this the “thermostat model”. With headlines reporting enormous fires from **Sacramento** to **Siberia**, it’s easy to feel that we’re already on the brink of a devastating global conflagration.

The truth, though, is stranger. Satellites allow researchers to monitor wildfires around the world. And when they do, they don’t see a planet igniting. Rather, they see one where fires are going out, and quickly. Fire has a long and productive place in human history, but there’s **now less of it** around than at any point since antiquity. We’re driving fire from the land and from our daily lives, where it was once a constant presence. What used to be a harmonious relationship between humanity and fire has become a hostile one.



Volunteers working at the scene of a forest fire in Siberia in August 2021. Photograph: Ivan Nikiforov/AP

Fewer fires burn today, but the ones left are formidable. Our pyroscape has become deranged, with fire taking on new shapes, visiting new places and consuming new fuels. The results are as confounding as they are unsettling, and our instincts are poor guides. Although we often hear about fires where rich people reside, such as in Australia's south and the US west, fires kill the most – by far – in places where poor people live, like south-east Asia and sub-Saharan Africa. The deadliest fires aren't the largest and most spectacular ones, but the smaller, regular ones that are rarely reported by global media. They kill by smoke rather than flame, and their main cause isn't global heating. Many are kindled by corporate-driven land clearance.

None of these conclusions should be particularly comforting. What they suggest, rather, is that fire is more complex than the thermostat model suggests. It's shaped by how we grow our food and place our settlements as much as it is by how we fuel our cars. Addressing our fire problem will thus require more than managing the rising temperatures of recent years – though that's still essential. It will also require us to confront a longer history that, since the Industrial Revolution, has thrown our relationship with fire out of whack.

Our rapid economic growth has taken fire from old places and carried it to new ones. The climate crisis has unbalanced things further. Today's unpredictable fires are a complex product of our economy and ecology. They're just not ones we've prepared ourselves for.

# H

Humans didn't "start the fire", the noted pyrohistorian William Martin Joel **has argued**. "It was always burning, since the world's been turning." The Joel Hypothesis, we now know, is only half right. People didn't invent fire – that part is true. But, surprisingly, it's a relatively recent phenomenon. For something like the first nine-tenths of Earth's history, a stretch of around 4bn years, the planet was an unburnable rock.

Fire requires fuel, oxygen and a spark. Lightning, volcanoes and even tumbling rocks can provide ignition, but without vegetation and oxygen, nothing will burn. It was only after cyanobacteria pumped the atmosphere full of oxygen and mosses and stemmed plants spread over land, which they did around 450m years ago, that the world's first fire broke out.

That wasn't just the first fire on Earth, but also the only fire within trillions of miles. The sun, despite appearances, isn't aflame; its heat and light come from nuclear fusion, not combustion. ("Don't think of the sun as a giant campfire," advises physicist Scott Baird, but as "a giant hydrogen bomb".) We know of no other planet, even outside the solar system, where fire exists.



Polar bears digging in a garbage dump in northern Canada. Photograph: Tom Nebbia/Getty Images

Fire flourishes where life does, and the two depend on each other. There are pyrophilous (“fire-loving”) plants and animals that organise their lives around fire, such as the **beetles** that lay eggs in burned trees or **pine cones** that need flames to release their seeds. More than individual species, whole ecosystems depend on fire to clear space. In many habitats, fire is “as fundamental to sustaining plants and animals” as sun and rain are, a 2005 scientific **survey** found.

The most successful pyrophilous species is *Homo sapiens*. Early humans used fire for light, warmth, social gatherings and protection from predators. Fire lets us absorb nutrients quickly through cooking, rather than spending hours chewing every day as our primate cousins do. Chimpanzees, orangutans and gorillas all eat raw food, and they all have much smaller brains. The caloric boost of cooking underwrites our large, resource-heavy brains. Simply put: no fire, no us.

No us in an evolutionary sense, and no us in a historical one, too. Every known human society has used fire. Our ancestors didn’t just dispel darkness and prepare food with it, they shaped their environments: repelling pests, flushing

out game and making clearings. With spears, they could hunt individual animals; with firesticks, they could alter whole landscapes.

It's easy to think of our forebears, using their torches to set forest fires, as vandals, but it's more accurate to see them as gardeners. Fire let people domesticate spaces by opening pathways, creating meadows and beating back the wilderness. The ancient Romans referred to a clearing burned in the woods as a *lucus*, a sacred grove where the light came through – it shares a root with “lucid”. People also set their surroundings alight to protect themselves against wildfires; doing so let them regularly burn away fuels that, if left to accumulate, might feed a hard-to-control blaze. Thus did “fires of choice”, in the words of the anthropologist Henry Lewis, replace “fires of chance”.

What must it have been like to use fire this way? Victor Steffensen sheds some light in his **recent book** *Fire Country: How Indigenous Fire Management Could Help Save Australia*. In it, he tells of **two brothers**, Poppy Musgrave and Tommy George, Aboriginal elders and the last speakers of the Awu Laya language. The pair grew up in the era of the **stolen generations**, the long stretch from the early 20th century to the 70s when Australian authorities forced vast numbers of Aboriginal children to assimilate by removing them from their parents and communities. Musgrave and George dodged that fate by hiding from the police in mailbags. By evading capture, the brothers served, until their deaths, as key repositories for an imperilled culture. Not only did they carry their language into the 21st century, they also carried firesticks.

“The old people used to burn the country all the time,” Musgrave told Steffensen. For Musgrave and George, fire wasn't destructive, but purifying. Thick vegetation, the sort others might interpret as lush or abundant, elicited howls of frustration from them. The overgrown country, in their view, was “sick” and “suffering”. “We need to burn it,” they exclaimed, to make it healthy.



Controlled burning on a farm in Denmark in August 2021. Photograph: Ritzau Scanpix/Reuters

The name in English for someone who starts fires is arsonist. It's telling that there's no familiar word for someone who carefully tends a landscape with flame. But Steffensen's book shows this to be as venerable a calling as any other. It bulges with wisdom relayed by the brothers: when and how to light boxwood country afire so nearby ecosystems remain intact, which gum trees to burn and which to leave be.

Australia, where Aboriginal people once travelled with firebrands and kindled the brush as they walked, offers a prominent example of firestick farming. But there's every reason to suppose that the practice was global. From the 16th century onwards, Europeans encountering the peoples of Africa, Asia, the Americas and the Pacific reported seeing intentionally set fires in all those places. This shouldn't have been surprising; Europeans had nurtured their own lands by burning them, too.

# T

he history of humanity is the history of fire, but you wouldn't know that from seeing how people live today. Fire – natural and human-made – has been banished from view, to the point where we regard its return with great apprehension.

Some of that fear makes sense. For centuries, cities had been built largely of organic materials – wood and thatch were common – and burned easily. London's **1666 fire**, which destroyed more than 13,000 structures, is famous, but it wasn't anomalous. A fire perhaps 20 times that size had levelled Constantinople six years earlier.

Europeans extinguished those “astonishingly frequent” fires, the historian Eric Jones argues, by switching to flame-resistant material. The “brick frontier”, as Jones calls it, spread through Europe in the 17th and 18th centuries, and soon elsewhere. As brick, concrete and eventually steel structures replaced wooden ones, urban blazes grew rare.

But Europeans fireproofed more than just their cities. Their inventions also drove fire from daily life. Steam technologies moved burning from hearths to boilers. Electricity provided energy, light and heat cleanly and quietly, with no indication of its origins. Our lifestyles today depend on combustion, in that **more than five-sixths** of global energy comes from burning fossil fuels. But aside from the tightly controlled flame of a stovetop gas burner or the occasional candle or cigarette, many of us can go weeks without seeing fire.

Is that a problem? It might have been to the ancients, many of whom worshipped fire gods. And yet the dominant mindset of modernity has been one of intense pyrophobia. The Enlightenment, as its name suggests, prized illumination. But it did so as “light without heat”, the philosopher Michael Marder has observed. As western technologies banished flames, western thinkers came to see firestick farming as dangerously primitive.



A blastfurnace at a steel factory in Germany. Photograph: Wolfgang Rattay/Reuters

Or, perhaps, just dangerous. European scientific forestry, which emerged in the 18th century and spread around the world, took as its mission the extirpation of fire. “Only YOU can prevent forest fires” was the message the US Forest Service drilled into children starting in the 1940s through its famed mascot **Smokey Bear**. But *should* forest fires – which occur naturally and have been profitably kindled by humans for millennia – be prevented? Forestry officials wouldn’t entertain that question seriously until the late 20th century. Until then, they sought to snuff out flames everywhere.

Today, forest managers have backed off their suppression strategy and are coming to appreciate **cultural burning**. (An Australian university granted the Aboriginal elders Poppy Musgrave and Tommy George honorary doctorates before they died in 2006 and 2016.) But the widespread fear of fire remains. This is surely why environmentalists latch on to images of wildfires. There’s nothing unnatural, novel or even necessarily worrisome about a forest burning. But we are children of the Enlightenment, and fire terrifies us.

# I

nfernos blaze hot on our screens. And yet overall, as scientists have repeatedly noted, the amount of land burning yearly is going down. By a lot. Between 1998 and 2015, it decreased by a quarter, according to a 2017 study in the journal *Science*. Even flame-addled California, where fires **have increased** in the past two decades, is still markedly less fiery than it once was. Stephen Pyne, a brilliant chronicler of fire's history, estimates that before Europeans arrived in California, fires, natural and anthropogenic, burned twice the area that they now do.

This counterintuitive finding – the global decrease in fires – isn't good news. The main reason fires are dwindling is that humanity is expanding. Sprawling settlements and industrial farms act as firebreaks in the savannas of South America and Africa and the grasslands of the Asian steppe. Livestock consume vegetation that otherwise might feed big burns. "A shift toward more capital-intensive agriculture has led to fewer and smaller fires," the authors of the 2017 *Science* study concluded. And that decrease – especially in flame-reliant landscapes in sub-Saharan Africa and northern Australia – outweighs the uptick in headline-grabbing megafires.

It might seem that extinguishing wildfires has made the world safer. But what it has really done is made the fires stranger. Where flame grows rare, biomass that would normally have regularly burned instead piles up as kindling. Decades of fire suppression is enough to build timebombs, and the supercharged blazes that do break out are more severe and harder to control. This is what the US now experiences every year: overall, the number of its fires is shrinking, while their size and the cost of fighting them are growing.

Purposeful burning can relieve the dangerous accumulation of fuel loads, but, without the intimate knowledge of a landscape that comes with centuries of tending it, it can also go badly awry. In 2000, a prescribed burn in a federally protected area of New Mexico **got out of hand**. More than 18,000 people had to

flee, and the fire came perilously close to the tritium facility at the Los Alamos National Laboratory (had it burned, radioactive contaminants would have spread widely). “The calculations that went into this”, **confessed** the secretary of the interior, “were seriously flawed.”

Surely they were, but in place like New Mexico, where decades of settlement spread and fire suppression have starved the land of flame, the slightest contact between industrial life and dry vegetation – a downed power line, an exhaust pipe brushing grass – can mean conflagration. In 2018, a blaze in California known as the Ranch Fire burned 1,660 sq km. Its start? **Sparks** from a rancher striking a metal stake with a hammer. The resulting fire lasted 160 days.

Such eruptive fires will only worsen with global heating, which dries fuels in fire-prone places. But global heating itself is a consequence of our modern relationship to fire. Because, despite appearances, we haven’t actually stopped burning things. Instead, we’ve extinguished open and visible fires and relegated burning to boilers and vehicular combustion chambers. There, fire feasts not on living grasses, shrubs and trees, but on fossilised plants that died hundreds of millions of years ago.

The difference is vast. Societies using living vegetation for fuel are tightly limited by what the land can grow, and what people and animals can haul. With fossil fuels, however, we dig deep into concentrated stores of ancient organic matter, incinerating **whole centuries’ worth** of buried plant life annually. The coal, oil and gas **we burn** each year required as much organic matter to make as the entire planet grows in roughly 600 years. And as we burn it, we release long-dormant stores of carbon into the atmosphere.

This has changed our relationship with time, the fire historian Pyne has observed. We used to burn what grew around us, with effects largely limited to our own day. Now we excavate plant matter from the deep past, burn it in the present, and send its byproducts wafting into an uncertain future.

One thing we already know about that future is that it will be hot. And that heat is lengthening fire seasons in the most flame-prone environments. After Black Saturday in 2009, Australians recalibrated their index of fire danger, adding a new category, “**catastrophic**”, to describe the record-breaking weather conditions that they now regularly encounter.



A sign indicates the highest fire alert level in Sydney, Australia in December 2019. Photograph: David Gray/Getty Images

Thus far, the raised temperatures haven't resulted in more fire overall; the global trend is still downward. But like fire suppression, the increased heat is encouraging new kinds of unruly fires, such as those in the far north. Arctic lands contain huge reservoirs of peat – ancient vegetation that hasn't entirely broken down. Historically, much of that peat has been buried under frozen ground or protected from flames by cold and damp conditions. But as permafrost melts and summers lengthen, those rich peatlands encounter fire and burn furiously. Scientists are now wrapping their heads around “**zombie fires**” that can survive through winter by feeding on smouldering peat underground and emerge in the spring, releasing huge stores of sequestered carbon.

We're now well into a geologic epoch in which our behaviour is the main driver of the climate. The **Anthropocene** is what we usually call it – the age of humanity. Pyne **thinks** we might just as well call it the Pyrocene – the age of fire. It was burning that got us here, and now we're facing the consequences of Earth's “unhinged pyrogeography”.

Seeing flames lick the suburbs of **Athens, Greece**, or **Boulder, Colorado**, it's hard to disagree. We're addicted to burning things, but we've kept fire like a shameful

secret, hiding it from sight and bottling it up in boilers. Now it's spilling out, uncontrolled: the return of the repressed.

# T

he wildfires tormenting combustible landscapes such as California – which has experienced eight of its 10 **largest recorded fires** in just the past five years – highlight the threat of climate breakdown. And yet the California fires, for all the attention they've received, have been more dramatic than deadly. The 2018 Ranch Fire, which burned **for months**, only directly killed one person. California's entire 2020 fire season, the largest in its modern history, was about as lethal as three days of traffic accidents on California roads.

That's something we rarely acknowledge about megafires: they burn plants and animals, but spare humans. The Centre for Research on the Epidemiology of Disasters at the Université Catholique de Louvain in Belgium maintains a **database** of more than 22,000 large global disasters since 1900. The earthquakes in its database killed on average more than 2,500 people, and the floods nearly 11,000. But the wildfires? They killed on average 23, rounding up.

It's not that fires are harmless. It's rather that the ways they harm people aren't the ways that come most readily to mind. Unless you're a firefighter, you're extremely unlikely to die in a big blaze. But you might shave years off your life by inhaling the particulates and chemicals that fires release.

The death toll from wildfire smoke is enormous: 339,000 die a year from such smoke-related maladies as strokes, heart failure and asthma, **according to** the Australian public health scientist Fay Johnston and her fellow researchers. A few die in the affluent places known for their telegenic fires, such as North America and southern Australia (more than 400 from Australia's 2019–20 Black Summer, Johnston and her colleagues **have estimated**). But the vast

majority die in poorer places, where fires are smaller, yet chronic: sub-Saharan Africa and south-east Asia.



A peatland fire in Ogan Ilir, Indonesia last year. Photograph: Anadolu Agency/Getty Images

The south-east Asian fires are particularly worrisome. Rather than visiting land that has regularly burned for millennia, they're feeding on Indonesian forests and peatlands newly penetrated by economic development. These aren't thermostat fires, where global heating is the main culprit (though it's not helping). They're chainsaw fires, lit as timber, palm oil, rubber, petroleum and gas firms pry open the closed-canopy forest. Moisture floats out, wind blows in and a largely fireproof ecosystem becomes combustible. Plantation managers have sped things along by torching trees to clear the land. And it seems that the people those plantations evicted may be setting fires in retaliation.

In 1996, as industrial development pressed on Indonesia's rice lands in Java, the nation's president, Suharto, initiated the Mega Rice Project to convert the peatlands of Central Kalimantan into Indonesia's new rice bowl. Over the quiet grumbles of experts – Suharto, then nearly 30 years in power, was not known for his receptivity to dissent – he had tens of thousands of workers dig 6,000km of canals through Central Kalimantan's waterlogged peat forests. Developmentally, this accomplished little – even drained, the area was a poor

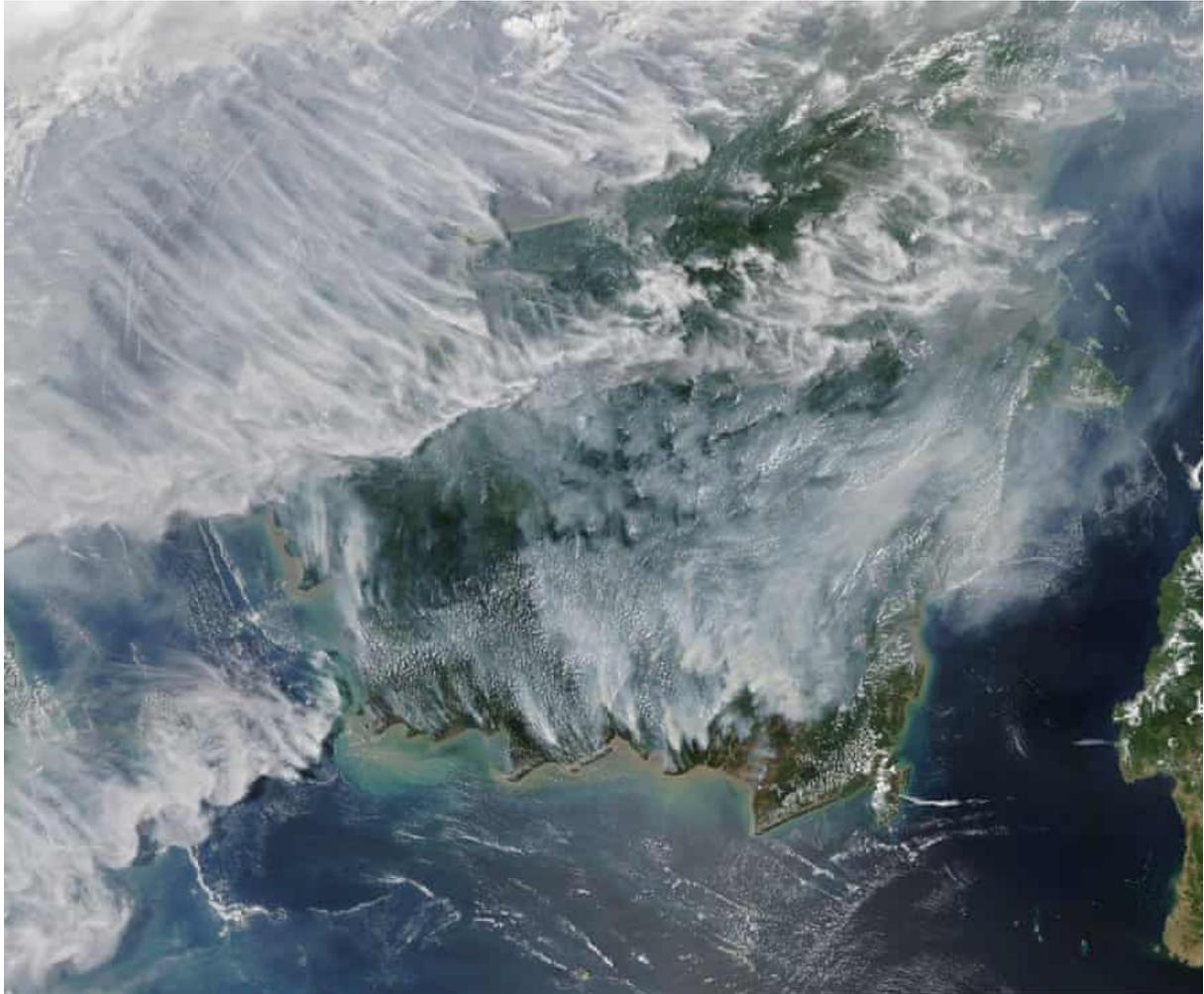
place to grow rice. But environmentally, it exposed long-submerged peatlands, with their vast stores of prehistoric carbon, to the flames.

No single one of Indonesia's many fires in recent decades has been especially noteworthy. But altogether they've been cataclysmic. In 1997, a dense haze of airborne particulates from Indonesia's fires was perceptible as far as the Philippines and Thailand. That year, on Sumatra – centre of Indonesia's fires – a commercial plane **crashed** due to poor visibility and killed all 234 aboard. The next day, two ships collided off the coast of Malaysia for the same reason, and 29 crew members died.

The economist Maria Lo Bue **found that** Indonesians who were toddlers during the 1997 haze grew less tall, entered school six months later and completed almost a year less of education than their peers. Another economist, Seema Jayachandran, **found** that the fires “led to over 15,600 child, infant and fetal deaths”, hitting the poor especially hard.

Indonesia's fires keep coming back, as does its haze. School closures, business losses and flight cancellations due to air quality are now routine. In 2015, another bad year, the plume from Indonesia's fires **stretched from** east Africa to the middle of the Pacific. Those fires, feeding largely on dried peat, were also shooting ungodly amounts of previously sequestered carbon into the skies. At the height of the 2015 fire season Indonesia was **emitting more** greenhouse gas daily than the US.

This catastrophe, engulfing the world's fourth-most populous country in a choking haze and badly exacerbating global heating, would seem to be a story with legs. And yet international coverage of Indonesia's fires has been sporadic at best. You can find recently published books covering California's wildfires from virtually every angle: investigative journalism about incarcerated women **working as firefighters**, an inspiring **chronicle** of a high-school football team from a burned town, a **children's book** about escaping wildfire and **an account** of Zen practitioners defending their monastery from a blaze. But a search on Amazon turns up only one book published in English about Indonesia's fires in the past 20 years: an 80-page economist's assessment of governmental mitigation programmes.



Smoke hovering over Kalimantan in Indonesian in September 2019. Photograph: Nasa Earth Observatory Handout/EPA

The result of this unbalanced coverage is a warped understanding. When we think of how humanity is kindling fires, we think of global heating, which is the sum of our energy use in general. Our “burning planet” becomes an existential crisis, linked to modernity, rather than one tied to any specific company, activity or governmental scheme. And we think mainly of how fire affects the affluent people whose property is at stake, rather than the poor people whose lives are.

Picture a dangerous fire and you’re likely to imagine a thicket of tall trees blazing in a drought-stricken climate. But a more accurate image is smouldering peat or scrub burning by a tropical logging road. The real threat isn’t catching fire, but the **slow violence** of breathing bad air. You’ve got a hacking cough, your father suffers a stroke and you watch your daughter – short for her age – leave school a year early.

# F

ire is not in itself a bad thing. Many landscapes, built to burn, simply couldn't exist without regular fires, either natural or intentional. Though foresters once sought to tamp blazes out everywhere, we now recognise that as a grave mistake. A fireproof planet isn't something we can get, or should even want.

It helps to think of fire as like rain. Our world needs precipitation, and some ecosystems even depend on floods. But, as we know, it's possible to have too little rainfall in one area and too much elsewhere, to see some places parched and others dangerously inundated. Something similar has happened with fire – we're getting too much and too little at the same time.

We badly need a healthier relationship to combustion. Rather than erratic, runaway fires, we need regular, restorative ones, like we used to have. Our forebears didn't shun flame – they were relentless fire-setters. But they adhered to two important limits. First, they fed their fires with living vegetation, which reclaims lost carbon as it regrows. Second, they were guided by long-acquired experience with fire's complex paths and consequences.

We've blasted far past both of those limits. We're now burning fossilised vegetation, which sends carbon on a one-way trip to the warming atmosphere. And we're kindling fires that bear little resemblance to the ones we're used to. There's no generational wisdom telling us what to do when we drain the peatlands of Central Kalimantan or let dry fuel pile up precariously in the **California** countryside, all while raising the temperature to hitherto unrecorded heights.



The Anthropocene epoch: have we entered a new phase of planetary history?

**Books about fire** typically end with prescriptions: we must invest in science, reclaim lost cultural knowledge, burn intentionally, build resiliently and power our grids renewably. All that is true, surely. But given how complex fire is, and how unprecedented nearly everything we're doing with it is, the best advice would seem to be: slow down. We have scrambled our landscape, changed our energy diet, altered the climate and revised our relationship to flame, all in a very short time. It's not a surprise that fire, once a useful if obstinate companion to our species, has now slipped our grasp.

The world won't burn up, as we sometimes imagine. But the fires of tomorrow will be different from those of yesterday, and we're racing headlong into that unsettling future, burning tankfuls of gas as we go.

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