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Life and Death on the Fire Planet

An Interview With Stephen J. Pyne

by Eve Ottenberg Facebook Twitter Reddit

Image by Fabian Jones.

Fire is everywhere, nowadays. In the Arctic, Siberia, Australia, Canada, the American West, even in some rain forests. Terms like "fire tornado" have entered the vernacular, along with "heat dome," which often, along with drought, set the stage for uncontrollable fires. Of course, everyone connects these blazes with climate change. We humans heated the planet by fire, namely the burning of fossil fuels. This in turn dried out entire regions, and they burn. How hot have we made it? Well, last summer the little Canadian town of Lytton smashed all records at 122 degrees Fahrenheit, while in Portland, Oregon, it was 116 degrees for a few days. Portland eventually cooled down, but not Lytton. After days of murderous heat, it burned to the ground.

Humans have a long and intimate relationship with fire; so intimate, it's there in our genetic code, or rather cookery is. Because of this deep relationship spanning hundreds of thousands of years, one professor of biology and society, who

has devoted years to the study of human fire, Stephen Pyne, believes we should rename the entire Holocene the Anthropocene, and its most recent, industrial phase, the Pyrocene.

Pyne makes the case for this quite convincingly in his new book, *The Pyrocene: How We Created an Age of Fire and What Comes Next*, which lays bare the complex, dynamic history of humanity and fire, and argues that earth is the only fire planet, because it has life. He also observes that only one genus on that planet, the hominins, have wielded fire. With its most recent iteration, industrial fire, we have a problem, one we can begin to solve not with the mistaken belief that we can remove fire from the living landscape, but with the recognition that there are different types of fire, some of which we can work with. Currently industrial fire is not one of them. It is out of control. We need to keep fossil fuels, Pyne argues, in the ground. He makes the case for this in the interview that follows.

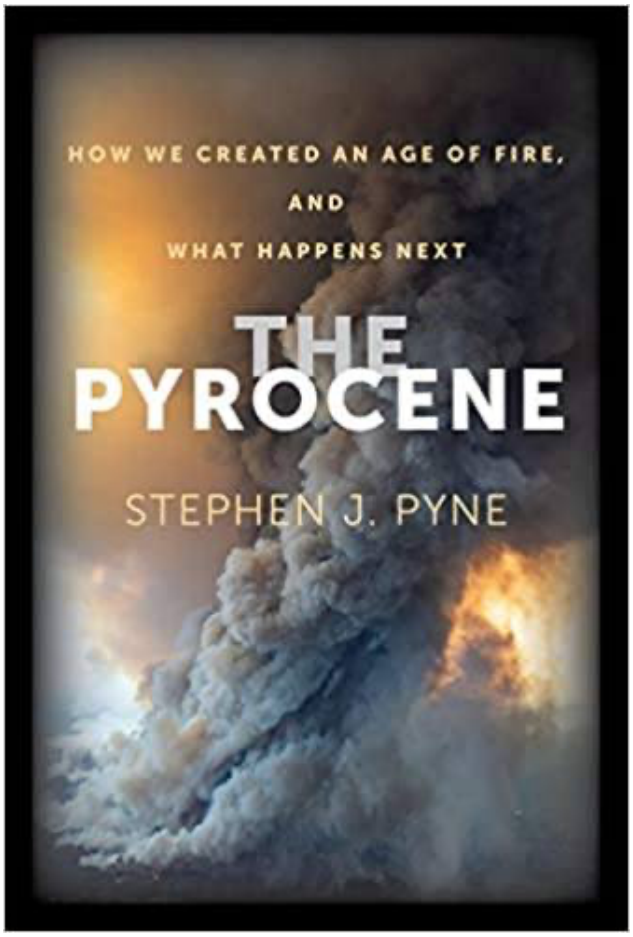
Ottenberg: Can you elaborate on paradox one, the more we try to remove fire from places that have coevolved with it, the more violently it will return, paradox two, that the actual amount of land burning decreases and paradox three, as we ratchet down fossil fuel burning, we must ratchet up burning living landscapes.

Pyne: The first paradox is that in places that have fires and are prone to fires, places that have wet-dry cycles, fire with lightning, or places where people have for hundreds of thousands of years put fire in, if you take fire out of that, that landscape begins changing in ways that make fire more severe. The amount of combustibles there builds up, it's not consumed, fire is not reducing it, often it rearranges itself in ways that make it more prone to more explosive fires. We have lots of examples of this from the developed world. One of the paradoxes of megafires is that it's a pathology of the developed world. If we look at Australia, U.S., Europe, Canada, in a different way Russia, we find that they all go through this period where they try to remove fire, and they find they have a worse fire problem afterward. Behind that fire removal is basically a transition to a fossil fuel society. So they believe we can replace fire in landscapes the same way we've done it in cities, or our houses, and it doesn't work that way.

The second paradox is that again as you begin transitioning to a fossil fuel society, you begin relying on fossil fuels or what could be likened to fossil fallow, as a source for all the things fire did in the past. So fire would fertilize, it would fumigate, it would reorganize the landscape, change the micro-climate. Fire was pretty instrumental to most agriculture outside of floodplains. And now we found substitutes for that, so we can use pesticides, herbicides, we can distribute with tractors and helicopters, and crop-dusters, all of which are emblems of a fossil-fuel-powered society. When you do that, you begin taking fire out of the places people live and operate in.

So again, I'm happy my house doesn't have a lot of free-burning flame in it and associated smoke. I'm happy my city isn't visited by free-ranging flames, but when we project that onto the landscape, we get other effects. Most of what happened is that traditional, fire-based agriculture is being replaced by fossil-fuel-powered stuff or fossil-biomass generated fertilizers and pesticides. So we're actually seeing a shrinking in the amount of area burned on the planet. That's area, not volume. What we're seeing is that more intense, severe fires, particularly in forested areas, are becoming prominent, particularly in the developed world. But despite the power and visceral response of that imagery, in the sense that the whole planet is burning, in fact the amount of area being burned is still being shrunk. And we are replacing it with a smaller amount burned that is burning more savagely. We're basically replacing what had been tamed fires with feral fires.

If you look at the news, Siberia's burning, Africa's burning, every place is burning. Well, a lot of those places burned anyway. We're seeing a reduction in the amount of many of these areas, except in the developed world, where the developed world has large amounts of wildland, often created in the name of conservation. State-sponsored conservation was an early reaction to the nineteenth century imperial outburst of



Europe and the amount of capital that was applied to scalping landscape after landscape and leaving large fires in their wake. Now we find that the areas we set aside to protect from this are being subject to another kind of fire. So we have this paradox that according to the media every place is burning. Greenland has fires now. But it's actually shrinking in the total amount of area burned, a lot of that in Africa and in places that have been grasslands that are now converted to a modern agriculture that doesn't rely on fire. Or more appropriately buries its fire in machines and other things.

And the third paradox is that we've been living in a phase in which our experience of fire, of free-burning fire and its associated smoke has been suppressed. It was suppressed for a period of time. Several generations grew up with the sense that this is the way the world is, that large fires don't free-range across the countryside, you don't use fire routinely, in agriculture or cleaning up your yards, or anything associated with an urban or suburban landscape, and we don't have that kind of smoke that used to be very common, very prominent, just background smoke, like seasonal pollen, it was just out there. All of that was removed for a period of time. We found that the cost of holding that down is that we get worse fires and we get giant smoke palls, these huge plumes that spread out – in some ways I liken it to the great dust storms of the '30s, so the end result is much worse. So as we ratchet down fossil fuels, and we recognize that the kind of the world we tried to create in wildlands and much of the countryside by the massive application of fossil fuel power, as that fails, we are still going to have a lot of stuff out there that needs to burn, not just that it will burn, but that it *needs* to burn to be able to function and do its ecological job. If we want those ecological goods and services, we have to burn. So as we ratchet down our burning of fossil fuels, we're going to be ratcheting up our burning of living landscapes, more than we have now, but one hopes that that happens in a more controlled way than what we're seeing, these spasms and eruptions – this is not how it's supposed to work. I mean, we're burning mature Sequoias now. Last year we lost 10 to 15 percent, this year it looks like we may lose an equivalent amount. We may in two years have killed 25 percent of giant Sequoia population. These are trees that are adapted to fire, but they're not

adapted to the kinds of fires they're experiencing now.

Ottenberg: And the kinds of fires we're experiencing now are happening because we've been using this other kind of fire, namely fossil fuel fire.

Pyne: Yes.

Ottenberg: Could you please explain the three types of fire, natural, anthropogenic and industrial?

Pyne: Yeah, the three fires. One way to look at the fire history of the planet is in terms of the three fires. The fire community likes to do things with triangles anyway, so here's the fire triangle applied to history. There was a time the earth didn't have fire. It got fire basically as a result of life. Life created the oxygen; life created the fuels. And when plants started colonizing the continents, they started burning. And we have fossil charcoal 420 million years ago. So very early, as soon as plants came, and terrestrial life has coexisted with fire ever since.

A big change occurs when species, actually a genus, acquires the ability to start and manipulate fire. We have creatures, a genus, hominins, acquire the ability to start fire. There's an interesting theory that I think has a lot behind it, that says it's cooking, the ability to cook, that made the transition, why we got small guts and big heads. To the extent that that's true, our relationship to fire is in our genome. That's how basic it is to us. Now there is only one species, one creature who has effectively a monopoly over fire on the planet and that's us. So that's the second fire, when we started cooking food, and then we went to the top of the food chain because we learned to cook landscapes. And now we've become a geologic force, we've begun to cook the planet. So we have a fire-wielding creature and at the end of the last glaciation, we have one hominin left and a fire-receptive world that's rapidly warming, it's becoming amenable to burning. So these two interact and this is second fire, anthropogenic fire, where humans use fire for hunting, foraging, even to assist in fishing. They'd use lights to attract fish. In agriculture the whole business of fallowing was to grow enough fuel so you could burn the fields, so that's second fire. And as Cicero and others put it in ancient times, we made it a second nature out of first nature.

And then a couple of hundred years ago, we began looking for more stuff to burn and went into the geologic past to find it. At this point we shifted from burning living landscapes to what I call lithic landscapes and that is fossil biomass. At that point the process starts going on after-burners, and it really accelerates. But it had been going on for thousands of years. So my sense of an Anthropocene is I would rename the whole Holocene as an Anthropocene. But in the last 150 years or so, we've gone through a phase-change. This different kind of burning competes with the others and then eventually begins colluding with them because of the changes it makes in the atmosphere.

This industrial fire or third fire is really different, because all of anthropogenic fire had certain ecological checks and boundaries to it. There were baffles and barriers. You could extend the season, you could change things, you can cut and dry fuel, you can drain wetlands and marshes and peatlands. You can do lots of things to bring fire where it wouldn't normally be, but there are still constraints to that. But when we get to industrial fire, all bets are off. You can burn day and night, winter and summer, wet or dry, it doesn't matter. And so there are no longer any internal constraints. Humanity's quest for fire had been a quest for more things to burn, stuff to burn and ways to burn it, and now it's become what to do about all the effluent. It's become about sinks not sources. We have no place to put it. So we're overloading the atmosphere, we're overloading the oceans. In some ways we're overloading

land, so we're taking carbon out, we're putting it in plants, where it becomes amenable to more burning. We've set up this kind of positive feedback system; it's really crazy. We're creating a fire world. That's my answer to those who, looking at the future, say that it is so strange that we have no connection to the past and no analog for what's to come. But for me I do think we have a great narrative to the past and that's humanity and fire, and that's a continuous story. We change things we do, but it is a constant relationship. And I think the analog is that we're creating the fire equivalent of an ice age.

Ottenberg: Please compare the fire age humans have created to the ice age. And why you call this the Pyrocene. For you the enemy is ice not fire?

Pyne: Anything in excess is bad. I like ice in my soft drinks. I like ice in my freezer. But when you have a world dominated by ice, there's not much you can do. It just sits there, particularly these enormous ice sheets. And then the peri-glacial phenomenon around it. Fire is different in that it's not a substance, it's a reaction. It's not that fire sits and burns continuously, like an ice sheet would, but that fire brands these areas, it informs them, it changes them. And we're seeing as in the ice ages, big shifts, bio-geographic shifts starting, underway, that seem to be quickening. We see a change in sea level, we see mass extinctions, we can have these peripheral phenomena – like you had these great outwash plains of sand and silt in the ice ages. I think that maybe the equivalent may be these enormous smoke palls that blanket from time to time. So there's a saying that all models fail but some are useful. It seems to me that all analogies fail but this is a useful one for uniting different things that are going on and the way in which humanity and fire are at the core of that. We're creating a Pyrocene. We go from Pleistocene to Pyrocene, fine. I don't expect it to be an internet meme. But it seems to me a useful way of pulling together a lot of things.

Ottenberg: How are we the only viable fire planet? There aren't other planets that have fire?

Pyne: Not that we know of. Other planets have combustible gasses, methane. Titan, Saturn's moon has got it for example. Lots of planets have lightning. They've got ignition. But they don't have all the ingredients that we have, and that's because we have life. Life as we know it is what created fire. We think of the chemistry of fire as a physical problem and something you can burn in a container or some kind of combustion chamber, and get stuff out of it. But really the chemistry is a biochemistry. It's the same chemistry as our metabolism. We break down foods, we call it respiration, when it happens in the open world, we call it fire. But it's the same chemistry. If you define it as a physical problem, then you think of physical solutions, countermeasures. So you drop water, retardant, you scrape away all kinds of combustibles, you do a physical response instead of thinking well maybe if this is intricately connected with the living landscape, maybe we need more beavers and prairie dogs. Maybe we need some controlled grazing. There are a lot of other ways to do this that are more benign than just trying these massive physical reactions against what we define as a physical threat.

Ottenberg: Can you briefly sum up historically what's the main error of fire management up until now. You mention this in your book and I got the idea from it that the main error was thinking we could get rid of fire completely.

Pyne: This is a great question and there's still a lot to be learned about it. I think the modern era, in which the control of fire was presumed necessary and possible is really tied in with European expansion in the nineteenth century and late eighteenth century, in reaction to a wave of mega-fires, which were actually much larger and more lethal than what we've seen recently. They went through a whole wave of this in the nineteenth century. It was not driven by climate,

it was driven by land clearing, by logging slash and railroads throwing sparks. There was the sense that we could and needed to eliminate fire and part of the conservation project, which was a global one, was creating large forest reserves. There were a few parks but mostly it was intended to be forests that would then be directed by scientifically informed engineers.

Foresters thought of themselves as engineers. And forestry turns out to be completely incompetent to deal with fire because it came out of central Europe that had no natural fire. They saw it as simply a social problem. Fire was viewed as an index of primitivism and social disorder. It needs to be controlled. You need to control the fire so you can control the peoples. And a lot of this was developed in British India and in a secondary way in some of French Africa, north Africa. This was transported to the U.S., Canada and Australia and Russia, in different ways.

So there was a sense that fire needed to be removed, the world would be better without it. They recognized that plants and animals had all kinds of adaptations to fire but they looked on fire the same way we might look on smallpox or malaria – they've adapted to it, but we'd be better off without it. So that launched a program that sought to remove fire, and a primary way to do that was to eliminate traditional burning. So in a colonial context there's an extra power arrangement involved, but Europe's elites treated Europe's peasants with the same disdain. They said all these people are out here burning everything for agriculture, we need to eliminate it. And they hated the fallow, because you're taking a field out of production once every three years or so? We need that in full production. We can't afford that. And then you burn it? So there was an intellectual failure, an inability to recognize fire and its natural value, and then there was a political context and an economic context in which it seemed to make sense that we could eliminate fire, we should eliminate fire and we have the power to do it. And for a while that works, but then the landscapes begin changing, the social relationships change and suddenly the whole thing becomes unhinged. The further you push this, the more aggressively you push it, the more you get this big blowback. So there were events, most of the major fire powers now, the U.S., Canada, Australia, Russia, had particular fire years or events that were especially traumatic, and that set into motion various policy programs with the idea if not eliminating fire then reducing it to the point where it's simply a nuisance. Depending where you are, you can do this for 30 maybe 50, 60 years, and then eventually the system begins pushing back. And then in addition we've got climate change, which acts as a performance enhancer, so now we can't even pretend. California has more fire-fighting power than anyplace on the planet, but in the face of these large fires they can't stop it. There's no pretense that they can. We've lost the ability to control it.

Ottenberg: Could you describe the three types of biomes – fire dependent, fire sensitive and fire independent?

Pyne: There are lots of typologies now for understanding how fire works in ecosystems. Behind that is a sense that it's not just whether something is adapted to fire or not, it's a patterning of fire, or fire regime. And I have to say journalists hate that term, they say you're going academic, but it's like saying you can't talk about climate, all you can talk about is weather. Fire regime is the patterning in space and time of how fire appears and things adapt to that. So the typology I'm quoting in this case was developed by the Nature Conservancy, which had a global fire initiative for a while and they were trying to see how far out of whack things are.

Certain systems are fire dependent. That is to say they don't function, they will be replaced by something else, if the right kind of fire doesn't

happen in the right way. There are other landscapes, other biotas, where they accept fire, it doesn't destroy them, but they don't necessarily need it. They accommodate fire. And then there are some places that can't take fire and only under extraordinary circumstances would have fire, say if you went in and clear-felled a big area, then it could burn. But otherwise it wouldn't burn in that way on its own. Or if you went in and drained a lot of tropical peat-lands for example. It would not normally burn, or very exceptionally burn once a century or so, but now you're changing it.

Ottenberg: Could you say a few words on the role of the Enlightenment in the human-fire relationship.

Pyne: This is a subject that could really use a lot of research, and I can't see anybody studying it in a systematic way. So let me give you a shorthand version. At the end of the eighteenth century, as the Enlightenment began spreading, fire disappears as a subject of serious discussion. Earlier, fire was represented in surveys of the earth, surveys of the heavens. It was not fire as we think of it, anything that had light and heat could be called fire. You had electrical fire, volcanic fire, but fire was a presence. And then, it disappears.

About the same time, several things happen, one is the invention of the modern steam engine, particularly with Watt, and so fire becomes something that is put into machines. Ben Franklin invents his Franklin stove, so it's another way of removing fire from the hearth and all of its flames and getting the heat that we want out of it without other stuff. Also, Lavoisier discovers oxygen and names oxygen. So suddenly fire is not this mysterious phenomenon, it's a subset of chemistry that involves this newly discovered element, oxygen. This begins the whole third fire, industrial fire story.

And then as Europe begins its second big wave of colonization that becomes a vector for carrying this industrial fire around the world. But there's no longer an intellectual basis for fire. There are people who study heat transfer, people who study light in terms of electromagnetic spectrums as a part of physics. They may study animal heat, but that's likening organisms to steam engines. But fire as a category of nature seems to vanish. Who studies it? All the other ancient elements, earth, air and water, all have academic disciplines devoted to their study, even whole departments. The only fire department on a university campus is the one that sends emergency vehicles when an alarm sounds. How did fire disappear, vanish as a subject? So there was no scholarship for studying fire at that time.

Ottenberg: It was Enlightenment snobbery?

Pyne: Yeah. There was also a sense that traditional knowledge was superstitious. It was not positive knowledge. It was not verified or verifiable. So the fact that peasants used fire or aboriginal peoples in Australia or hunter-gatherers in Canada, all these other people were using fire extensively, was actually taken as a mark of primitivism. And they're quite explicit about this, that if you use fire you are primitive and pre-rational, if you find an alternative to fire, you are rational. Well, the alternative to fire turns out to be another, third fire. It's a fire that we don't see. It's a fire that we put into machines and use to get power and other things out of.

Ottenberg: And that turns out to have its own problems.

Pyne: Yes. I'm at the age where there are no fixes, there are only trade-offs. And the Enlightenment has its own trade-offs. There were some remarkable things that came out of that era, but it suppressed fire and the knowledge that humans had accumulated over thousands of years about how to live with fire, and sought to replace with something else that didn't exist. So now

we're scrambling to rebuild a core of knowledge so that we can live with fire. How did humanity for a couple of hundred thousand years live with fire without destroying itself? And now suddenly, we have all this power and science and machines and computer uplinks, satellites and everything else, but we're in a kind of self-immolation. This is part of the paradox of why is it that mega-fires are a pathology of the developed world? Basically, the index of development is how much fossil fuel energy you get.

Ottenberg: How is fire encoded in our genome? You said there's a theory that it enabled us to develop larger heads and smaller guts because we pre-digest our food by cooking it.

Pyne: That's right. We sort of predigest it. That means that you don't need giant jaws and crunching teeth to break stuff down. You cook it. Cooking also detoxifies some stuff, some foods are not really accessible without it, or some foods have parasites and you remove that by cooking. But it also means we don't need giant guts to process all this heavy, starchy plant matter or even meat. We can have smaller intestinal processing because we're already processing it before we put it in our mouth. At that point the head can take different shape.

Ottenberg: This must have happened in prehistory. This would be way back.

Pyne: Homo Erectus.

Ottenberg: Please explain swidden and how plants, grazers and fire make a three-body problem for fire ecology.

Pyne: Swidden is an artificial term that was invented about 70 years ago for anthropologists to describe all the ways in which people used fire in farming. Slash and burn farming of various kinds. And people did it with trees, they did it with shrubs, peat. The point is you create opportunities for fire to come into a place by draining wetlands, killing and drying trees, woody plants so that they're amenable to burning and so forth. You do this on a cycle. In the eighteenth century there were some interesting surveys of this around the Baltic, and it was even called "circulating," because they recognized that people would then come back to the same sites. Not every place works. There are some places you can do this, and some places it doesn't work. In Sweden, and we've got some interesting maps of this, it's the middle range of the mountains. When you get up too high it's too cold, when you go down too far, you get frost from evening inversions, so you want to do that middle zone. They could be quite intricate systems. You could see this all over the world.

So you create fuel, and then you burn it and then you let the fuel recover. So that's a fallowing period. It may be one year, two years. In forested areas it may be twelve or forty. It depends on the local conditions. There were hundreds of terms for this. Swidden was invented as a way to talk about all of them. That's dealing mostly with plants. The animal side of it is much more complicated. Generally, grazers and browsers will go to freshly burned sites that are just resprouting. That is the most nutritious, and palatable feed; they will go there preferentially and there are lots of examples around the world of people…not driving but herding, in a loose way, the animals that they wanted to hunt by burning – where they burned, went. So then you could come back to the same sites and burn and that gets transferred over then into herding.

The most famous versions of this occurred in places where you have mountains. So the Mediterranean in Europe. The animals go up during the summer and down during the winter, and as you leave, you often burn the landscape so that when you come back it's all full of fresh growth and you don't have old growth that could then catch fire as wildfire and threaten your flocks. So this becomes a regular pattern of

burning integrated with the movement of flocks. But where it's not quite so contained, going up and down the mountains on your regular route, when you're out in larger grasslands, things seem to be out of sync. You don't control it. Some years are wet, some dry, and it's also the case that the animals compete with the fire for that fine fuel. So suddenly it becomes more complex. You need a lot of space to be able to do that.

About a year and a half ago there was an interesting report – some scientists had found a dinosaur, an aptasaur, a plant eating dinosaur, and they were able to analyze the stomach contents. And one of the things they found was charcoal. Eating charcoal? No. They were going to the burned areas, because that's where the best browse and forage is going to be. So they're absorbing some of that as well as eating the rest of it. So this is a very old pattern.

Ottenberg: Lastly, if you could elaborate how our fire practices may have forestalled a return of the ice and how keeping fossil biomass as a stockpile to ward off ice's return in the future – how that works, what do you mean by that?

Pyne: I'm going out on a limb on this one because I'm not a climatologist. When I was still in graduate school, the big story out of climatology was the next ice age. And it was inevitable. For two and a half million years we'd been in a rhythm of ice ages. We've been living in an interglacial, a fool's paradise because we think it will go on forever, which it won't, because all the great physical processes, geophysical processes, astronomical processes, orbit of the earth and the rest of it, that created this odd rhythm, of glacial and interglacials are still at work. Nothing has stopped that.

We have been in an interglacial for a long time, and it's coming to an end. It will end in hundreds of years? A few thousand years? But it's coming. And there are some interesting studies now that say we seem to have broken that cycle by warming the planet. My sense is that we have been warming it up for a long time. But when we went on fossil fuels we went on after-burners. The whole thing has just accelerated. The good news is that we may be forestalling the next ice age. And I think ice is a lot harder to live with than fire. We are a fire creature, after all.

The bad news is that we've lost control of the fire age. At some point there's no difference: it's self-destructive either way. My sense is we need to put or keep our fossil fuels in the ground. Future generations may be very happy we did, because they may need that to warm up the planet. We know we can warm up the planet and probably forestall a future ice age, or dampen it by doing all this burning. We've shown that. And in the future, we may really need it. Right now, we don't need it, and we're creating havoc of all other sorts. From the fire perspective, good fire makes us and bad fire unmakes us. We have an old alliance with fire, a mutual assistance pact for a long time, but now we've made it into a Faustian bargain and in a fire-centered history, we will live by fire or die by fire.

Eve Ottenberg is a novelist and journalist. Her latest book is *Birdbrain*. She can be reached at her website.