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## CLIMATE APOCALYPSE OR PROSPEROUS “FOSSIL FUTURE”? A CLIMATE HERETIC SPEAKS OUT

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Suppose everything we think we know about carbon and climate is wrong?

Here's the conventional wisdom: The use of hydrocarbons as fuels is responsible for climate change that is manifestly harmful, making drastic reductions in the use of fossil fuels a practical and moral imperative. To begin to remedy the problem, we need to electrify almost everything, reduce energy consumption overall, and keep fossil fuels in the ground.

But suppose that conventional wisdom is wrong? Suppose we're making a mistake by decarbonizing? If we are, what are the costs of that mistake? What benefits of fossil fuel use are we giving up?

Alex Epstein, in a wildly unorthodox new book, [Fossil Future](#), observes that cheap abundant energy, provided by fossil fuels, is the key to human flourishing. It enables us to eat well, sleep in comfort, travel without hardship, and get the medical care we need. The economic superboom of the last 250 years — the one that started with 80% of the world in extreme poverty and ended with half the world in the middle class — was set off, during the Industrial Revolution, by the discovery that coal, oil, and other fossil fuels could be used to do easily the work that had been done arduously by human and animal muscle power.<sup>1</sup>

Almost everyone agrees that energy abundance and human prosperity are closely linked. What's remarkable about *Fossil Future* is Epstein's claim that the benefits of fossil fuels are so large that a change in the climate is a small price to pay for them — in the face of a large and persuasive body of data supporting the opposite position.

Fossil fuels, Epstein says, are what enable us to transform what he calls a “naturally unlivable” planet, one full of almost insurmountable hazards, into a “unnaturally livable” one. It's livable — for us humans — because we've modified nature and created “unnatural” conditions like antibiotics, hydroelectric dams, and air conditioning. (I argue later in this review that it's completely natural for us to have done those things.)



Alex Epstein

[Source](#)

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<sup>1</sup> “Half the world is middle class” is the [World Bank's judgment](#), based on their criteria for being middle class. By U.S. or western European standards the percentage is much less, but it's still a huge improvement from only 50 years ago when almost no one in China and very few in India were middle class by any standard.

Abandoning fossil fuel use would be a tragic mistake that would send us back to the poverty and misery of the Middle Ages, says Epstein. Actually, it would be worse because we now have eight billion people to feed. According to his analysis, only the concentrated and readily available energy provided by fossil fuels can enable the Earth to sustain our population (which is still growing). Because fertilizer production and other aspects of the food supply chain rely so intimately on fossil fuels and there are no good substitutes, abandoning them would cause many of the Earth's eight billion to starve.

### AN UNORTHODOX REVIEW OF AN UNORTHODOX BOOK

Like many book reviewers, I blend three separate themes: a summary of the book, what I think of the book, and what I think about the topic (independently of the book). It's impossible to keep all these threads separate. But because the topic is so contentious and Epstein's views differ from mine in some important aspects, I've added more clues than usual — “Epstein says...” or “I believe...” Bear with me as I tiptoe my way through this minefield.

First, a few words about the book itself. *Fossil Future* is full of fascinating content but it's not a great read. Epstein's writing is workmanlike and thorough, but repetitious and a bit pedantic. You can grasp the principal ideas of the book by reading just a couple of chapters. But because Epstein's message is so different from what we're accustomed to hearing about climate, and so important if he's even partly right, the modest effort needed to become familiar with the book's main ideas is worth expending.

I am disappointed with one important aspect of *Fossil Future*. All decisions involve tradeoffs. The current discussion about climate, fossil fuels, and energy involves some of the most important decisions in human history. Yet Epstein pays little attention to the tradeoff between the costs and benefits of fossil fuel use. Almost the whole book is about the benefits, and the losses we'd suffer without them. But there are tradeoffs, critically important ones, and for that reason I can't give the book my enthusiastic recommendation.

### WHY EPSTEIN BELIEVES WE NEED MORE FOSSIL FUELS, NOT LESS

Epstein takes the interesting position that, even if the planet is warming and the main cause is the use of fossil fuels by humans, we are best off with a “fossil future.” In his view, the benefits of fossil fuels are so overwhelming that we should stop trying to reduce their use and in fact increase it. He argues that billions of people are profoundly energy-poor; the moral imperative is to provide them with more energy, not less; and fossil fuels are the only energy source that meets his three criteria for usability — ready availability, low cost, and concentration. (For fuels to be “concentrated” in this context means that they do not take up much space or weigh much, relative to the energy they can produce. This makes them easy to transport, store, and use for weight- and volume-sensitive applications such as cars and airplanes.)

Epstein is not only concerned about the poor. In his view, much of what we regard as civilization depends on the cheap, convenient energy from fossil fuels. Our most productive people (the “rich”) are responsible for much of our scientific progress, literary and artistic production, and enterprise. I don't want that to stop!

The author devotes a *lot* of ink to the idea that fossil fuels convey benefits we cannot otherwise get, except at extraordinary expense or perhaps not at all. He supports his side of the story passionately, but the book would have been much better if he had presented both sides of the story and said why he favors the fossil-future side, in light of strong evidence that rising atmospheric CO<sub>2</sub> poses a variety of significant dangers. Instead, in his enthusiasm for promoting his thesis, he neglects the debater's most powerful tool — understanding, and stating in as sympathetic tone as possible, the opposing position.

## IS CLIMATE CHANGE BAD?

At this point I move to a general discussion of the fossil fuel question, framed by Epstein's chief arguments. Let's begin with a very basic question — assuming for the sake of argument that the average temperature of the planet is rising, partly or mostly due to human activity: Is this “bad” or “good”?

That's a fair question, rarely asked. If, *a priori*, you regard *any* change in the climate as bad, you're tacitly assuming that the climate is already optimal. This assumption is logical. While Siberians and Saudi Arabians might disagree, the world's people have, knowingly or otherwise, already decided where to live, work, and farm based on *the climate that is*. They've “optimized.” If they've been effective at doing so, then any other climate pattern is, indeed, bad to a greater or lesser degree.

But it is risky to assume that “no change” is always optimal. Climatologists speak of “climate optimums” including the Minoan, Roman, and Medieval Warm Periods, as well as other periods that were not optimal. The Little Ice Age in Europe (c. 1300-1850), which followed the Medieval Warm Period, was brutal, causing widespread famine, wars, political chaos, and eventually mass emigration to the New World. The climate in Europe during the Little Ice Age would have benefitted from a little warming. There are places on Earth today that would benefit from cooling.

While it seems farfetched that the world at large will benefit from an even warmer climate than we have now, the rising level of atmospheric CO<sub>2</sub> — largely blamed for the warming — is a different story. CO<sub>2</sub> is plant food (and plants are animal food), so we'd expect the impact of recent CO<sub>2</sub> increases to show up as “global greening” — and it does. Exhibit 1 shows the effect over 1982-2006, a relatively short period.<sup>2</sup>

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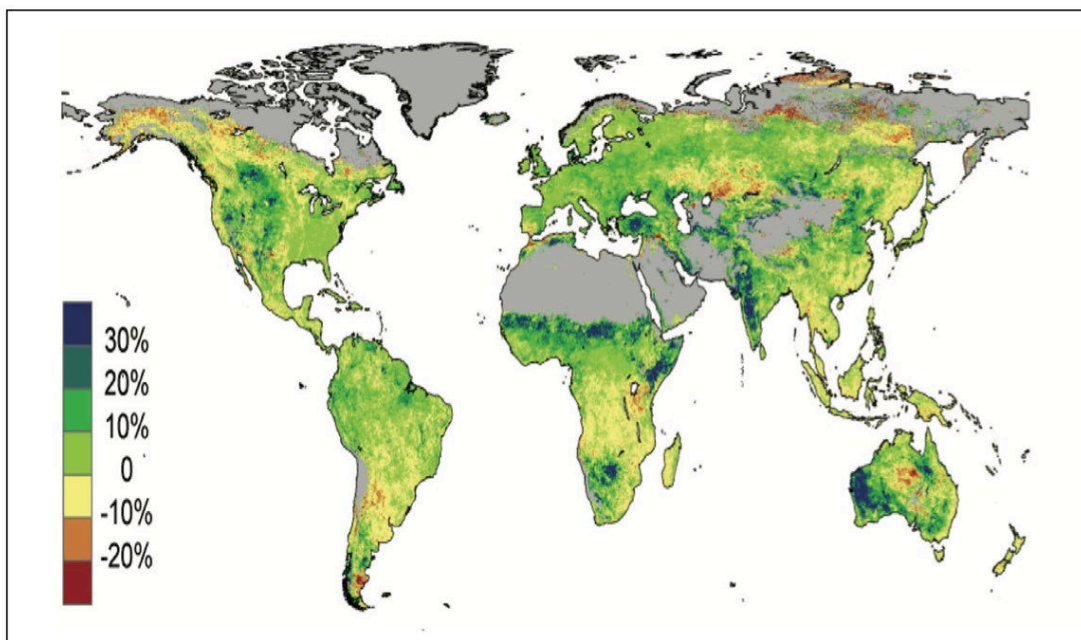
<sup>2</sup> See also <http://www.atmo.arizona.edu/students/courselinks/fall12/atmo336/lectures/sec5/holocene.html>.

The literature on climate fluctuations during recorded human history is extensive, and is widely accepted (not considered “dissenting”).

## EXHIBIT 1

### GREENING OF THE EARTH, 1982–2006

#### PERCENTAGE CHANGE IN FOLIAGE COVER AS REVEALED BY SATELLITE



[Image source](#)

Underlying source: Donohue, R.J., et al. 2013. "Impact of CO<sub>2</sub> fertilization on maximum foliage cover across the globe's warm, arid environments." *Geophysical Research Letters*, Vol. 40, pp. 3031-3035.

Following this logic, Epstein suggests that a further increase in atmospheric CO<sub>2</sub> might be a positive good, lowering food prices and expanding the land area suitable for habitation. Accused of being a global warming denier, he wrote:

I am actually an outspoken global warming affirmer. The real point of contention is not whether there is some global warming and whether human beings have some climate impact, but...whether warming is a problem.<sup>3</sup>

The tradeoff that Epstein didn't discuss, but should have, would open large areas of Canada and Russia to agriculture but possibly make some tropical regions too hot to support their current large populations (or too hot to live in at all). While the greening in Africa and India in Exhibit 1 suggests that warming in these regions may not be all bad, Epstein should have at least mentioned this issue. And greening that is good for plants may not be good for people if the temperature is insufferably high.

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<sup>3</sup> In a Center for Industrial Progress [newsletter](#), not *Fossil Future*. The Center for Industrial Progress is Epstein's company, which he calls a "for-profit think tank."

## NATURE RED IN TOOTH AND CLAW

Much of Epstein's case for a fossil future is built on the idea — my words, not his — that nature hates us. The playwright David Mamet said it best, in *The Secret Knowledge*: “[T]he benevolence of Nature...[is a]...fantasy. Anyone ever lost in the wild knows that nature wants you dead.” Epstein seems to have built his worldview around this thought.

One doesn't have to be lost in the wild to figure out that Epstein is mostly right. Nature wants us to die around age 35 after producing a large number of children, most of whom also die before 35 and many before five. Nature has endowed us with a planet that is only habitable in a few climatic zones unless you have housing (including heat) and clothing. On the Earth that Nature gave us as raw material, there isn't much to eat; most of people's energy went into getting more energy (that is, food). Nature throws horrible diseases and dangerous animal and plant enemies at us and gives us only modest defenses, just enough to keep us from going extinct, although we almost did exactly that several times in the distant past.

To quote a marine biologist named Bonnie Eldred (1910-1991) — I have to have a literary source or I'd get in trouble — “Mother Nature is a bitch.” (The more genteel Alfred, Lord Tennyson added, “red in tooth and claw.”)

If we want to live in anything like civilized and healthful circumstances, then, we have to shape our environment so that it is friendly to human beings. We have to terraform the Earth,<sup>4</sup> and that's what we've been doing, so far with such remarkable success that some geologists refer to the current time period as “the Anthropocene” — the age of people.<sup>5</sup>

## TERRAFORMING THE EARTH

But we are also a part of nature! All creatures — animals and plants and microbes — do their best to mold their environment to their own needs. We also do it — it's part of our job as a species, consistent with the survival imperative. (Due to competition from other species and the changing hazards of just being alive, a species that does not try to expand its population will not survive.) But we are the only species that modifies the Earth, for its own benefit, in a way that you can see from space. We can do that because the required large-scale engineering can only be done by a species with a higher intelligence and access to sophisticated tools.

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<sup>4</sup> “Terraforming the Earth” is a wry twist (not original to me) on the idea of “terraforming” other planets to make them more like Earth so we can live on them. I'd rather make the Earth a better place to live — Mars is too far away and has almost no air or water, no food, and not much sunlight. A wag said that anyone wanting to colonize Mars should first spend a year on top of Mount Everest because it has a much better climate. Brand was the author of the original *Whole Earth Catalog* in 1968.

<sup>5</sup> In a recent development, the [governing body for the geology profession](#) declared that, according to the [New York Times](#), “the Anthropocene does not yet have an official place on the geologic time scale” and “Our planet...is still in the Holocene epoch, which began 11,700 years ago with the most recent melting of the ice sheets.”

In other words, it's only *natural* that we, just like any other species, try to terraform the Earth and it's just as natural that, given our special endowment of brainpower, we're pretty good at it. We don't always do it wisely — what appears to be beneficial to us sometimes isn't — but, having dramatically raised the standard of living for almost everyone while simultaneously increasing our population eightfold over the last 250 years, we have more to be proud than ashamed of.

Nevertheless, our success at terraforming the Earth — our impact — has turned some people against human flourishing and in favor of a degrowth, anti-human, or in Epstein's words *anti-impact*, stance. According to Epstein, not only is the impact of fossil fuel use widely regarded as immoral because it disturbs the non-human components of nature — it's thought to be immoral because it *helps people!*

I couldn't make this up. Anti-humanism is a common thread in respectable, widely read literature. Sir David Attenborough (no less): "We are a plague on the Earth." Alan Gregg, a medical doctor and Rockefeller Foundation program officer, in a 1955 article for the hyper-prestigious journal *Science*: "The Earth has cancer and the cancer is man." Nature writer and novelist Edward Abbey: "Growth for the sake of growth is the 'ideology' of the cancer cell."

Enough already. All of us — especially environmentalists — should be embarrassed to be associated in any way with this awful anti-humanism.

We all have our own ideas about how best to terraform the Earth, about how to leverage nature's bounty to help human beings. Epstein would have us continue doing what we've been doing, and then do more of it. Many people fervently believe that such a course of action would destroy us. Who's right?

## A PERSONAL VIEW

If I wanted to alienate half of my readers, I would say that Epstein is right. If I wanted to alienate the other half, I'd say that Epstein's call for a fossil future invites or guarantees catastrophe. If one were to take a poll, the catastrophists would win.

But I believe that neither of those positions is correct. First and foremost, I know that I do not know. But I do have a point of view, which is that I am a moderate on most topics, including this one, and I count myself as an eco-pragmatist. Eco-pragmatists believe in using technology, economics, and innovation to address environmental challenges.

Like other eco-pragmatists (sometimes called ecomodernists), I believe that climate change is real and at least partly human-caused but *is just one of many problems that we face*. Climate change will mostly impose unwelcome costs and inconveniences on us — in case of complete climate inaction, costs almost beyond imagining, and inconveniences on the scale of our ancestors having to migrate across the ocean in leaky boats to avoid famine. But the widespread characterization of climate risk as "existential" does not reflect our known and tested ability to adapt to almost anything.

Because we will need to adapt to a changing climate, we should devote substantial resources in advance to doing so. Responding to the challenge of a warming world is a problem in resource allocation: resources used for reducing CO<sub>2</sub> output can't be used for anything else, including adaptation.

And adaptation is likely to be much more successful than mitigation (CO<sub>2</sub> reduction), although some resources should be allocated to each. Adaptive strategies include [coastal protection](#) and the breeding or [genetic engineering of crops](#) and livestock that will thrive in the climate conditions of the future. We will also need to deal with increased migration of peoples, a thorny issue if ever there was one.

A concise document outlining the eco-pragmatist approach, signed by a long list of luminaries from the left, right, and center, is at <http://www.ecomodernism.org>. An even better, but much longer, read on the topic is Stewart Brand's book, [Whole Earth Discipline](#).<sup>6</sup>

## GETTING FROM HERE TO THERE

Consequently I believe that, to get from “here” (the current situation) to “there” (a largely nuclear and renewable future, or something like that), *we will use a lot of fossil fuels* — and we should, for the reasons outlined in Epstein's book.

How long a journey is it from here to there? Vaclav Smil,<sup>7</sup> dean of energy scientists, says that past energy transitions — wood to coal, coal to oil, and so forth — have taken at least a half century.

This energy transition could take that long, or even longer, because of the variety of new technologies required but, even more fundamentally, because of the sheer volume of energy that we're going to need.

How much energy will we need?

Humans currently use 25 petawatt-hours of power per year. (A petawatt is a million billion watts.) Saul Griffith, an [energy writer](#),<sup>8</sup> shows that replacing only half of that with new clean energy would require 45,000 square miles of solar panels and solar thermal mirrors, *plus* 2.6 million wind turbines, *plus* 1.5 million square miles of biofuel-producing engineered algae, *plus* 27,400 geothermal steam turbines, *plus* 3,900 one-gigawatt nuclear reactors. These facilities would cover the land area of North America.

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<sup>6</sup> Brand is one of my favorite writers and thinkers, and is featured in my 2019 book, *Fewer, Richer, Greener* (chapter 24). His writing is extraordinary, and if you get anything out of this review besides my thoughts on Epstein, it should be to check out Brand's work if you don't know about it already.

<sup>7</sup> Bill Gates's favorite author. Gates reviews Smil's book *Invention and Innovation* [here](#). My review of Smil's book, *Size*, is [here](#).

<sup>8</sup> Griffith is a carbon super-hawk. He repeats the phrase “climate emergency” the way baseball announcers repeat “ball four.”

The punchline: Griffith says he's an optimist.

The second punchline: if the world economy grows as hoped in this century, with poor countries becoming middle-income and middle-income countries becoming rich, we'll need *three times* the petawatt-hours that we're now using.

So, every possible energy technology, including some far-out ones like space-based solar power and photo-microbial fuel cells (what could possibly go wrong?), must be explored.

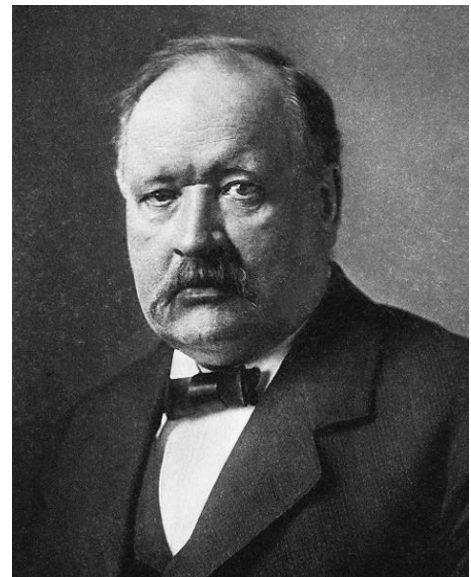
### A VISIT FROM SVANTE ARRHENIUS, WINNER OF THE 1903 NOBEL PRIZE

Much of *Fossil Future* could have been written 120 years ago by [Svante Arrhenius](#) (1859-1927), who is usually described as the discoverer of global warming — although, ironically, he was more concerned about global cooling. He won the 1903 Nobel Prize in Chemistry for unrelated work.

Epstein's views are very similar to those of Arrhenius, who saw mostly upside from warming – and he expected a *lot* of warming, 6° C if atmospheric CO<sub>2</sub> increased by 50%. (So far, the temperature increase is approaching 1.5° C with a rise in atmospheric CO<sub>2</sub> of almost exactly 50% from preindustrial times. But the temperature could rise further.)

Arrhenius described two benefits from warming: (1) protection from a future ice age, and (2) a more fertile Earth, needed to feed a growing population. He wrote,

By the influence of the increasing percentage of carbonic acid [i.e., CO<sub>2</sub> and water] in the atmosphere, we may hope to enjoy ages with more equable and better climates, especially as regards the colder regions of the earth, ages when the earth will bring forth much more abundant crops than at present, for the benefit of rapidly propagating mankind.<sup>9</sup>



Svante Arrhenius in 1909

[Source](#)

As it happened, the cold regions of the Earth have indeed warmed more than the hot ones, and have become [greener](#).

Arrhenius didn't seem concerned about overheating in the tropical regions, which may not have been on his radar screen. A warming trend in the amount that he predicted, if distributed evenly across the Earth, would be catastrophic for people and crops in the Middle East, parts of the Indian subcontinent, and parts of Africa and Southeast Asia. Temperatures in these

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<sup>9</sup> Arrhenius, Svante. 1908, in English. *Worlds in the Making: The Evolution of the Universe*, p. 63.



places regularly reach 50° C (122° F), a level also reached on occasion in Phoenix and Las Vegas, and once in Los Angeles. Add Arrhenius's forecast to that and you get 56° C (132° F), enough to send the roughly two billion residents of those regions scurrying for shelter in colder climes. And some of them wouldn't get there alive.

Fortunately, Arrhenius's 6° C warming forecast didn't happen. But that doesn't mean it can't, or that local temperature increases won't be disabling to agriculture, comfort, and ultimately human life.

Arrhenius also didn't say anything about sea-level rise, which is turning out to be a problem. And his one-variable (CO<sub>2</sub>) climate model neglected the important effects of water vapor and many other factors. But he got the greenhouse effect right,<sup>10</sup> and that appears to be the prime mover of climate change in an industrialized world.

### EPSTEIN'S QUIRKY, EFFECTIVE RHETORIC

A philosophy major in college and self-described philosopher, Epstein is true to stereotype in using distinctive rhetorical devices to advance his points. I admire his creativity in doing so — but I also want to be careful about being manipulated, because the devices have a surprising amount of emotional power.

Consider the following phrases, which are repeated over and over like Homeric epithets:

*Naturally unlivable and unnaturally livable.* This phrase pairing, mentioned earlier, is hard to forget. We've gone from "nature red in tooth and claw" to mastery of nature in what is, on an evolutionary scale, an amazingly short time.

*The knowledge system* is the socially established mechanism by which scientific and other intellectual discoveries are transmitted to the educated populace, thus forming a body of accepted beliefs. Understandably, given his views, Epstein is frustrated by it.

*The empowered and unempowered world* describes the gulf between energy haves and have-nots. In the empowered world, you walk into a room, flip a light switch, and the light comes on every time. In the unempowered world, some people are so energy-poor that their children, instead of going to school, have to search all day for twigs and dried dung to use as cooking and heating fuel. That the unempowered world still exists (and is as large as it is) indicates how far we still have to go in producing enough energy. In my book *Fewer, Richer, Greener*, I described the children's plight and then asked, "You want to take energy away from these people?"

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<sup>10</sup> Arrhenius was not the first to note that there was a greenhouse effect — that was the American scientist Eunice Newton Foote in 1856. (Foote was a distant relative of Isaac Newton.) The better-known Irish physicist John Tyndall investigated it further in 1859. Earlier speculations on the trapping of solar radiation by the Earth's atmosphere include those of the French mathematician Joseph Fourier (he of the "Fourier transform" in calculus), who wrote about it in 1824. Scientific discovery is a team sport.

*Climate mastery* is the ability of humans, using technology and vast amounts of energy, to protect themselves from actual and potential climate hazards. These hazards range from ordinary heat, cold, and stormy weather — we’ve just about licked these in the empowered world — to worst-case climate scenarios that would be fantastically destructive. To achieve the climate mastery that will be needed if the scariest outcomes happen, we’ll need a lot of energy, other natural resources, and money.

The list of Epstein’s *bon mots* and catchphrases goes on, but I’ll stop.

## CONCLUSION

The philosopher-activist Alex Epstein could have benefitted from a few economics courses. Economics teaches us basic life lessons: the universality of tradeoffs, the need to weigh costs against benefits, the power of incentives, and the law of unintended consequences. These concepts fall under the rubric of political economy (as climate surely does!) but one might not intuit them from the supply and demand diagrams used by economics professors on the first day of class to chase away curious students. While Epstein pays lip service to cost-benefit analysis, he doesn’t really do any, and the idea of tradeoffs fades to invisibility in his work.

Despite these flaws, *Fossil Future* has the great virtue of setting forth, in considerable detail, a point of view that you’re unlikely to encounter unless you look for it. To be fully informed on all sides of the climate controversy, read at least enough of the book to understand the main ideas. They’re worth considering.

If you think there’s no controversy, read the whole thing.



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