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When the Day After Tomorrow Has Come

By CORNELIA DEAN

Imagine that it is 2050 — or even 2020 — and you are the president. Your science adviser has brought you alarming news: Greenland's inland ice sheets are melting so fast that sea levels are about to rise dramatically. Moreover, thawing Arctic permafrost is about to pour huge quantities of heat-trapping methane gas into the atmosphere, which will make the already roasting planet even hotter.

The crisis, your adviser tells you, is now.

What can you do?

Quite a bit, to hear some researchers tell it. They say it should be possible to "geoengineer" the planet to cool its increasingly raging greenhouse fever. But they say these possibilities must be tested now, so that when the world needs to act, the scientific community can offer responsible advice. Their ideas are the subject of a new book, "Hack the Planet," by Eli Kintisch, a reporter for the journal Science.

Mr. Kintisch begins by describing a two-day meeting organized to discuss the ideas, held in 2007 in Cambridge, Mass. The meeting, under the auspices of the American Academy of Arts and Sciences and Harvard University, brought together researchers who have been thinking about these ideas for years — some with enthusiasm, some with alarm.

Geoengineering is generally defined as the application of engineering techniques to alter the planet as a whole. As far as climate is concerned proposals fall into two groups.

The first involves removing carbon from the atmosphere by, say, fertilizing oceans with iron, to encourage the growth of plankton or algae. In theory, the plankton would absorb the carbon and, when they die, take it with them as they sink to the ocean floor. (As Mr. Kintisch relates, private groups have already experimented with this technique, in hopes of eventually selling credits to buyers eager to offset carbon emissions.)

The second approach involves reflecting solar radiation back into space by, say, spraying sulfate aerosols into the atmosphere to make the Earth, in effect, shinier.

But, as Mr. Kintisch relates, these remedies are not necessarily simple and even their easy-to-envision consequences can be alarming. For example, encouraging plankton growth would encourage the growth of the creatures that feed on plankton, potentially disrupting the ocean food web. Sulfates in the atmosphere might disrupt rainfall in some areas, causing droughts.

And then, of course, there are the "unknown unknowns," things we won't even know we need to worry about until it is too late.

Plus, once some of these remedies are in place, they must be maintained indefinitely. Injecting sulfates into the atmosphere won't stop carbon dioxide and other greenhouse gases from accumulating there. So if the project is abandoned, Earth won't revert to its earlier temperatures. Instead, the intervening accumulation of atmospheric carbon could cause temperatures to zoom calamitously, virtually at once.

Also, of course, there is more to climate change than heat — and engineering Earth's temperature will do nothing to reduce problems like changing chemistry in the oceans, which are acidifying as their carbon dioxide levels rise.

For some, the most worrisome thing about geoengineering is the idea that, once people know about it, they will think of it as a technological quick fix that makes it unnecessary to control emissions of greenhouse gases, an effort everyone takes pains to point out is by far the most important step to be taken now.

Still, if geoengineering is not yet an idea whose time has come, it is definitely gaining traction. It is discussed in two other new books, "Fixing the Sky: The Checkered History of Weather and Climate Control," by James Rodger Fleming, a professor of science, technology and society at

Colby College, and “Coming Climate Crisis? Consider the Past, Beware the Big Fix,” by Claire L. Parkinson, a NASA scientist whose specialty is polar sea ice and a forthcoming book, “The Climate Fix,” by Roger Pielke Jr., a professor of environmental studies at the University of Colorado.

For Dr. Fleming, whose book is a scholarly look at the history of weather modification and similar efforts, geoengineering proposals are “untested, untestable and dangerous beyond belief.” He fits them neatly into what he calls “a long tradition of imaginative and speculative literature involving the ‘control’ of nature.” But, as he notes, the ideas have drawn favor especially among conservatives and libertarians who look for technological rather than regulatory solutions for climate change.

Dr. Parkinson, whose book deals largely with the evidence that human actions are altering climates, notes that “good intentions do not necessarily lead to good results.” So far, she writes, humanity’s record of environmental manipulation does not inspire confidence.

In his discussion of geoengineering in “The Climate Fix,” Dr. Pielke argues that research into geoengineering techniques could advance scientists’ understanding of the action of Earth’s climate. But if the techniques are put into effect, “unintended consequences are certain,” he writes, adding “there is no practice planet earth on which such technologies can be implemented, evaluated, and improved.”

His book will be published in the fall.

Mr. Kintisch makes the same point, in a way, beginning many of his chapters with tales of well-meaning efforts gone awry (species brought in to control pests that themselves become pests, irrigation projects that end up poisoning the soil and so on).

In March many of the participants in the Cambridge meeting joined other researchers at the Asilomar Conference Grounds in Pacific Grove, Calif., famed as the site of a 1975 meeting where biologists and others struck by the emerging power of DNA technology began work that eventually led to regulation of the work.

But if participants in this year’s meeting hoped to do the same for geoengineering, they must be disappointed. Perhaps it is too soon to expect results especially since, in their own way, the

technical issues surrounding geoengineering are at least as complex than those surrounding DNA. And the stakes are at least as high.

Meanwhile, there has been relatively little discussion so far about who would make geoengineering decisions — would the world accept an American president in charge of the decision to go ahead? Assuming we could tune the Earth to a desirable temperature, who would say what that temperature would be? What side effects would be acceptable? Who would be compensated for suffering them. And so on.

I attended the Cambridge meeting Mr. Kintisch describes at the beginning of his book. Afterward, I talked to participants about what it would take to devise and implement any geoengineering plan the world's wildly diverse people and governments might buy into. And who would regulate it or police any "rogue state," nonprofit or commercial venture ready to act on its own?

Participants I spoke with were at a loss. "World government," one of them, finally, offered. The answer does not inspire confidence either.

All the while, humanity is already engaged in a gigantic geoengineering experiment, one that has been under way, however inadvertently, since people started large-scale burning of fossil fuels 150 years ago. So far, the world's efforts to act together on the problem have been, to be charitable, unimpressive.

The lesson, as all three authors put it, might therefore lie not in figuring out how to "hack the planet" but rather to change things so that planetary hacking will not be needed at all.