

Why Geoengineering is Dividing Climate Scientists

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A Controversial Technology Is Creating an Unprecedented Rift Among Climate Scientists



By [Alejandro de la Garza](#)
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If you can think of something, there's probably a scientist studying it. There are researchers looking into [naked mole rat breeding patterns](#), the [aerodynamics of cricket balls](#), and that people tend to like pizza better than [beans](#). But there are also certain experiments that scientists generally don't do. They don't, for instance, [genetically modify humans](#), or [clone them](#). They don't conduct psychology experiments without subjects' informed consent. And there's a whole host of experimental medical procedures that could teach us a lot, but no one would ever be [justified](#) to try.

Many scientists have long thought of experiments to inject chemicals into the earth's atmosphere in order to cool the climate, known as stratospheric aerosol injection (SAI), as falling within that taboo category—arguing developing the technology could pose serious

planetary risks. But some researchers have been working to alter that perception in recent years, splitting the climate science community. In recent months, the field has seen a surge in momentum: last month the U.N. Environment Programme called for more research into geoengineering, while reports emerged last summer that the Biden Administration has begun coordinating a five-year research plan. Rogue researchers and Silicon Valley entrepreneurs meanwhile conducted small scale tests late last year and in February, despite condemnation from much of the scientific community.

All that attention has added fuel to the smoldering disagreements among climate scientists, creating what is likely the most significant rift in the world of atmospheric science and climate studies in years. Academic factions have published a series of dueling petitions as part of an increasingly visible and contentious battle for control of the scientific narrative—and ultimately over how to tackle climate change as emissions continue to rise. One side says that humanity may doom itself by refusing to look into potential chemical means of cooling our atmosphere. The other claims that undertaking such research could lead to disastrous consequences that we can barely imagine.

No one person or organization has a monopoly on decisions over what scientific questions are off limits for ethical reasons—the answers tend to come about from messy consensus among governments, scientific bodies, and individual researchers. And until recently, when it came to geoengineering our atmosphere, the majority agreed the risks outweighed the opportunity. There's the risk that such geoengineering technology would be used by the wealthy and powerful at the expense of others—that we'll use it to save coastal property from inundation by rising sea levels, but end up disrupting monsoons and causing famine in Southeast Asia in the process—or that disputes between nations over who gets to set the global thermostat could lead to war, or, in an extreme scenario, to nuclear armageddon. There's the moral hazard argument: that if governments and industries begin to perceive SAI as a reliable plan B for climate change, they'll use it as an excuse to hold off on making urgently-needed emissions cuts. And then there's the Frankenstein's monster aspect: that is, the deep unease that many people feel in altering what seems to be the natural order of things, and the foreboding sense that something will, almost inevitably, go terribly wrong.

Solar geoengineering remained largely outside the scientific mainstream until the early 2000s, when influential scientists like David Keith, now a professor of applied physics at Harvard University, first started advocating for more study and discussion of using chemicals to cool the planet. A succession of papers, books, and philanthropic donations to support research followed over the course of the next two decades, particularly from tech billionaires like Bill Gates who became interested in the technology's potential. By 2021, the momentum was shifting, with respected organizations like the National Academies of Sciences, Engineering, and Medicine recommending scientists "cautiously pursue" solar geoengineering research.

Hansi Singh, a professor of climate dynamics at The University of Victoria in Canada says things have changed markedly. Back in 2016, she was interested in studying geoengineering after graduating from a PhD program, but was warned away from the field because it could taint her reputation. “There’s been enough negative sentiment that people ... were afraid to go into that area,” she says. “There’s less of that now.”

Advocates like Singh say that the turnaround is partly due to the worsening climate situation. With emissions still not falling nearly fast enough to avoid dangerous impacts, geoengineering seems more like an option that may one day need to be considered. But those opposed to geoengineering work are skeptical. They see the shift in favor of exploring this solution more as the result of a sustained lobbying effort. “A very small group of individuals with a lot of financing, they’re pushing for this,” says Jennie Stephens, a professor of sustainability science and policy at Northeastern University. “The advocates are very good fundraisers.”

That growing support for research into geoengineering technology has led to a serious schism in the normally friendly world of climate science. “You think of polarization only in terms of Trump and Twitter, but it doesn’t come home to roost.” says Aarti Gupta, a professor of global environmental governance at Wageningen University in the Netherlands. “We are friends—we know each other. And then suddenly there’s this issue.”

For opponents of geoengineering research, a 2021 [article advocating for more study of the field](#) in influential science journal *Nature* was an indication that the proponents were making headway, as was a plan that year by Keith’s Harvard research group to test SAI technology in the skies over northern Sweden. That project was later [canceled](#) due to opposition from environmentalists and local Indigenous groups. But Frank Biermann, a professor of global sustainability governance at Utrecht University in the Netherlands, says that the fact that Keith’s project got as far as it did sent shockwaves through the broader environmental sciences community. “It was a signal that these folks are serious,” he says.

Biermann helped organize [a letter in response](#) to those developments. It was published in January 2022 and signed by dozens of scientists and climate researchers, with the goal of making it clear that the academic community didn’t want governments to develop solar geoengineering technologies. He says it’s a sign that anti-geoengineering scientists are getting more organized. Today, more than 400 academics have signed the letter, including influential climate scientists like Michael Oppenheimer, a professor at Princeton University and one of the [original voices](#) who warned about the danger of global climate change. “So many people have ignored this debate for a long time,” Biermann says. “They’re now getting a little bit into the fray because they are concerned.”

Many of those involved in studying geoengineering saw the letter as a direct attack. Daniele Visioni, a researcher at Cornell University, immediately began discussing ways to counter calls to restrict such research. To him and other proponents of studying geoengineering, to

avoid working in the field was to lose out on a chance to better understand the risks and potential benefits of a technology that is likely to be on the table in the future. “You cannot say we shouldn’t be studying this because someone somewhere in the future might misuse it,” Visoni says. “You are making the decision for other people, and for people that maybe don’t exist yet.” Eventually, they settled on the idea of producing their own letter that would show support for geoengineering research. “People that do [geoengineering] research are always on the defensive,” he says. “There’s been a realization that we need to be more forceful.”

Visoni’s [letter](#), published late last month, gathered more than 100 signatories, largely from European and international researchers, as well as other prominent scientists like James Hansen, a professor at Columbia University and another of the original scientists who called for action on global warming. It emerged alongside another similar U.S.-focused [call for support](#) for geoengineering research, published around the same time.

Researchers who work on geoengineering often emphasize that such climate interventions are no substitute for emissions reductions, and stress the need for global agreement and fair governance in how the technology might be used. Other potential players, like private business, might not be so scrupulous. Singh, who signed on to the second pro-geoengineering research letter, says that [reports in December](#) of a controversial series of test flights by geoengineering startup Make Sunsets helped to galvanize their side of the debate—it was a clear sign that if researchers and government bodies didn’t start studying geoengineering seriously, someone else might take matters into their own hands, with unpredictable consequences. “There’s no research body that has come to any sort of general agreement, and so within the vacuum, anybody can come in and claim that they’re going to do some smoke and mirrors and cool the planet,” Singh says.

For those opposed to researching geoengineering, though, those controversial experiments have been a sign of exactly the opposite. The pro-geoengineering research faction may be adamant about the ethics of how the technology should be deployed, but once those scientists lay the scientific groundwork, the decision of how the technology is used might be out of their control. Biermann, of Utrecht University, says the pro-geoengineering researchers don’t understand that—he calls it “Captain Kirk syndrome.”

“The idea is there is this kind of [global] President who behaves like Captain Kirk, and the scientists are like Mr. Spock, the person who has absolute logic,” he says. “[But] Captain Kirk is not real life. There is no Captain Kirk.”