

Climate Hackers and Rain Kings

The strange history of weather modification — and what it may mean for climate change

[George Dillard](#)



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On Christmas, 1859, Thomas Austin gave himself a little present. He let 13 rabbits, imported from Europe, loose on his estate in Victoria, Australia. He thought it might be fun to have something to hunt.

Seven years later, in 1866, hunters killed 14,000 rabbits on his estate. The bunnies, having found suitable weather, no natural predators, and seemingly limitless food to eat, bred like, well, rabbits.

Austin's mistake was the beginning of the rabbit conquest of Australia. The little mammals [colonized](#) two-thirds of the country in 50 years. Though they may have been cute on an individual level, by the hundreds of millions they were a plague. Rabbits crowded

out native species, ate up farm animals' food, altered ecosystems, and caused erosion. They cost Australian farmers their income and, in some cases, their sanity.

Australians tried all sorts of things to control the rabbit population. They shot them, of course, but that wasn't effective enough. They bulldozed and blasted rabbit warrens. They poisoned and trapped them. When these means of killing didn't work, they tried to fence off parts of Australia from the rabbit hordes, but these efforts weren't entirely successful either.

Finally, in the 1950s, Australian authorities decided that, to control one invasive species, they'd have to introduce another. Scientists decided their best bet against the bunnies was to introduce the *myxoma* virus, which had infected rabbits in South America, into Australia.

I am reminded of the Australian solution to rabbit plagues when reading about ideas for geoengineering. There's a growing group of people who believe that we'll never hit our climate goals by limiting emissions. Instead, they argue, we need to start actively and intentionally shaping the Earth's environment to mitigate the effects of climate change. Many of the geoengineers' ideas center around introducing new pollutants like sulfur into the atmosphere to lessen the impact of the greenhouse gases like carbon dioxide and methane that are already up there.

Pollute to alleviate the effects of pollution? Sounds like what the Australians did with the rabbits — introduce a new species of disease to kill off an invasive species. It didn't work there. The virus killed 99.8% of all the rabbits, but those that survived were immune to the disease. The rabbit population bounced back.

Will geoengineering work? It's too early to say, but, like Australia's rabbit problem, it has a long history, and previous attempts to control the weather and climate are full of unintended consequences.

People have been trying to control the weather for longer than you'd think. At first, they used religious techniques: the Mayans, for example, painted people blue and [sacrificed](#) them to a rain god,

while other societies engaged in rain dances, offerings of food and drink, or fervent prayer to get the weather they wanted.

Efforts to control the weather took on a more scientific sheen in the nineteenth century when self-styled “pluiculturalists” (more commonly called “rain kings”) promised drought-plagued farmers that they could bring moisture forth from the sky.

James Pollard Espy — the “Storm King” — made the first scientific argument that human activity could alter the weather. Espy started out with a distinguished career, working as America’s first government meteorologist and publishing some important works on weather, including an 1841 book called *The Philosophy of Storms*. But his ideas grew stranger over time.

Espy came to believe that setting “[great fires](#)” — for example, lighting the Appalachian forests ablaze — could seed clouds and create rain. He set [12 acres](#) of woodland on fire in 1849, but it had no effect. He persisted in his obsession with making rain, to the point where his friends worried about him. One thought his ideas were going to ruin him — they were “in my mind so entirely impractical that, as I informed him, should one of his enemies get hold of it, the influence of yourself, myself and all his other friends, would not be sufficient to sustain him.”

Despite this ignominious beginning, the idea persisted that human activity could somehow make it rain. During the Civil War, General [Edward Powers](#) became convinced that it tended to rain soon after heavy artillery fire. He concluded that the noise of military engagements shook up the clouds, causing them to release the moisture they contained. Congress allocated him \$2500 to test his theory.

Nothing came of these experiments, but the “[concussion theory](#)” of rainmaking stuck around. People blew up a lot of stuff in the late 1800s and early 1900s in attempts to change the weather. A former Confederate general named Daniel Ruggles took out a patent on concussion rainmaking in 1880, and a lawyer with the magnificent name of Robert St. George Dryenforth tried a combination of explosive balloons and kites in Texas in 1891. Cereal king C.W.

Post got in on the action, too, detonating a lot of dynamite in Battle Creek, Michigan and Post City, Texas to try to bring forth the rains.

The efforts got enough attention that F.W. Clarke wrote a [poem](#) making fun of the rain kings:

Said Jeremy Jonathan Joseph Jones

“The weather is far too dry,

So I reckon I’ll have to stir my bones

And try the effect of concussive tones

Upon the lazy sky.”

So Jeremy Jonathan Joseph went

Away to the nearest town: And there his money was quickly spent

For queer contraptions all intent

To make the rain come down...

There were other strange theories during this period. In the early 20th Century, a guy named Charles Hatfield developed a secret fluid that, when evaporated from pans atop high towers, supposedly caused the rain. San Diego paid this “[great moistener](#)” to alter the local weather, but, after a major flood (which probably had nothing to do with his methods), it disavowed him and broke its contracts with him.

These early efforts at weather alteration eventually died out, as there was no real evidence to support them.

The middle of the 20th century saw a new wave of efforts to control the weather, this time based on more solid science. Vincent Schaefer, a scientist at General Electric, found, quite by accident, that dry ice could create ice crystals if combined with cold water vapor. He rented a plane and dumped some dry ice into the clouds above the Berkshire mountains to test his theory. It snowed, and he and other scientists — especially [Irving Langmuir](#), the winner of the 1932 Nobel Prize in Chemistry — began to dream of total human control of the weather.

Langmuir and Schaefer came to understand that raindrops or snowflakes only fall when they’re heavy enough for gravity to pull

them out of the air. It's easier for droplets to stick together if there's some sort of "seed" in the cloud — essentially, something that the droplets can attach to.

Langmuir thought this insight would transform the world. He soon pronounced that he'd figured out how to control the weather. Unlike the 19th-century "rain kings," his goals went beyond simply making it rain during droughts.

Langmuir believed that cloud seeding could weaken [hurricanes](#). If pilots could seed the clouds around the eyewall of a hurricane, they could expand the eye and decrease the velocity of the storm's winds. He convinced the U.S. military to let him try his theory out. In 1947, "Project Cirrus" dumped almost 200 pounds of dry ice into [Hurricane King](#), which had already devastated Miami and now seemed harmlessly headed out to sea. Instead of weakening, the hurricane strengthened after the seeding and turned back toward land. It ended up making landfall in Savannah and killed one person.

Langmuir's hurricane failure caused other scientists to re-examine his data; they found that many of his earlier "successes" at making it rain or snow had been dubious. Even in the case of Hurricane King, nobody could really tell whether Langmuir's intervention had changed anything at all.

This didn't stop the military from continuing to try to control the weather. The logic of the Cold War dictated that any potential military advantage had to be pursued lest the other side get there first. Dwight Eisenhower's advisors [warned](#) him that "If an unfriendly nation gets into a position to control the large-scale weather patterns before we can, the result could even be more disastrous than nuclear warfare."

The Soviets had indeed been working on this technology, as well. Stalin, after all, had proclaimed that his worker's paradise would demonstrate its mastery over nature. Soviet scientists established an [Institute of Rainmaking](#) in 1932 and seeded clouds with calcium chloride in the 1930s.

In some ways, Soviet aims were more ambitious than the Americans' — understandably for a land bound in ice, they wanted to [modify the climate](#) rather than control the day-to-day weather. The Communist Party designated climate modification as one of its major goals in the 1960s and spoke of “the annihilation of the ice cover of the Arctic.”

Though the Soviets ran some ambitious experiments, the biggest single Cold-War-era effort to change the weather was an American one. During the Vietnam War, American strategists realized that the monsoons paralyzed the movement of Viet Cong supplies along the muddy Ho Chi Minh Trail. If the United States could prolong or intensify the rains, it would gain a strategic advantage.

Starting in 1967, “Operation Popeye” flew over 2,000 missions to seed clouds over Vietnam with silver iodide. In the eyes of the military, this was a relatively humane form of combat — they would, in the words of the Air Force, “[make mud, not war](#).” And the best part was that nobody knew they were doing it.

Well, after a few years, somebody found out. The press and some politicians got wind of the secret program and publicized it. Critics attacked the program for two contradictory flaws: that it cost a lot of money but hadn't had much effect and that it had perhaps caused awful floods in North Vietnam. The United Nations, worried that the weather would become yet another weapon of war, [banned](#) the use of weather control to gain an advantage in conflict in 1976.

Many nations still practice cloud seeding to try to make it rain in arid regions. The United States does it in the dry parts of the West; so do the United Arab Emirates and China. It's still [unclear](#) how much good the practice does.

But this cloud seeding is small potatoes compared to the grand visions of today's geoengineers. They want to manipulate the Earth's environment to lessen the impacts of climate change. The geoengineers generally advocate two approaches: removing carbon from the atmosphere and reducing the solar radiation that is absorbed by the Earth.

This second approach, solar radiation management (SRM), is a relative of the weather-control techniques that have been tried over the last two centuries. It generally involves dumping stuff into the atmosphere to block sunlight. The most common approach is to pump sulfur dioxide into the sky. Though it's normally considered a pollutant, in this case, sulfur dioxide would combine with water particles in the atmosphere to block some of the sunlight coming toward Earth. The effect would mimic what happens from time to time after a big volcanic eruption, dropping the temperature of the planet by a degree or two.

Just as happened in the 1800s and again in the 20th century, people — whether they're entrepreneurs or hucksters lies in the eye of the beholder — are taking it upon themselves to mess with the climate. A group of Silicon Valley "disrupters" has launched startups and, in at least one case, tried to inject sulfur into the atmosphere without permits or permission. Many of them say that such approaches are humanity's only hope for warding off the worst of climate change.

As we enter what feels like a third wave of trying to engineer the climate, it's worth reflecting on the first two. Our previous attempts to mess with the weather came with great hype but eventually fizzled. They revealed that attempts to intervene in natural systems can sometimes have unintended consequences — or no effect at all. Many of the people who tried to change the weather didn't fully think through the potential effects of what they were doing, and often didn't consult the people who would actually be affected by the changed weather. And, in some cases, their attempts got hijacked by states for military or geopolitical purposes.

Now, the third time may be the charm, and it's possible that history is no guide to what might happen with geoengineering this time around. But if we're going to embark on a third wave of attempts to modify the atmosphere, we should do so with our eyes open to what happened in the past.