→ Mark your confusion.
→ Purposefully annotate the article (1-2 mature, thoughtful responses per page to what the author is saying)
→ Write a 250+ word response to the article.
(If you are a teacher or student who would like to modify this Google Doc, go to File > Make a Copy. I cannot and do not respond to Share requests -- my apologies!)

Should scientists artificially cool the planet to stave off climate catastrophe?

By *The Week* staff, December 6, 2020

Should scientists artificially cool the planet to stave off climate catastrophe? Here's everything you need to know:

What is geoengineering?

Some climate scientists are coming to believe it's humanity's only hope for slowing or stopping disastrous changes in the climate. As runaway carbon dioxide emissions contribute to melting ice caps, widespread flooding, prolonged heat waves and droughts, apocalyptic wildfires, and devastating hurricanes, researchers are exploring planetary-scale interventions in Earth's natural systems as a way of counteracting climate change. Geoengineering has been debated since the 1960s, when U.S. scientists suggested floating billions of white, golf ball–like objects in the oceans to reflect sunlight. Interfering in natural processes was widely considered naïve and dangerous until recently, but as the window to curb global warming shrinks, proposals to reflect sunlight, shade Earth's surface, accelerate carbon absorption in the oceans, and remove CO_2 from the air are being taken more seriously. In October, SilverLining, a nonprofit, gave $3 million toward climate-engineering research. "I liken geoengineering to chemotherapy," said Michael Gerrard, a professor of environmental and climate law at Columbia University. "If all else is failing, you try it."

What are the most plausible proposals?

SilverLining's grant recipients are researching whether humans can blast sunlight-reflecting aerosol particles into the stratosphere, mimicking the cooling effect of volcanic ash clouds. In 1991, Mount Pinatubo in the Philippines erupted, spewing sulphate particles into the atmosphere that caused global temperatures to drop 0.6 degrees Celsius over the next two years. Solar-radiation management would involve sending fleets of airplanes up about 65,000 feet, where they'd spray sulfate aerosols into the upper atmosphere, or perhaps even diamond dust. A research team at Harvard University projects that if high-altitude tankers had the capacity to make 60,000 particle dumps by 2035, it would shave off 0.3 degrees Celsius of warming.

What else is being explored?

Another idea is to pump salt water from oceans into the air, forming water droplets that would make marine clouds brighter and thus more reflective. Australia is funding research, hoping enhanced clouds could cool water temperatures enough to save the already damaged Great Barrier Reef. Cambridge University researchers are studying whether ships can pump salt particles into low-lying polar clouds to help refreeze polar ice caps. Other researchers wonder whether seeding oceans with iron could stimulate the growth of marine algae, which soaks up CO_2 from the air. For now, solar-radiation management is thought to be scientifically the sturdiest candidate. "We know with 100 percent certainty that we can cool the planet," said Dr. Douglas MacMartin, a Cornell University engineer.

So why not do it now?

Meddling with Mother Nature is risky. Earth's weather systems are interconnected in extremely complex ways, which is why climate change is believed to impact everything from how long hurricanes linger over coastlines to how fast wildfires accelerate. Tinkering with one aspect of weather could have dangerous, unforeseen ripple effects: Two years ago, Nature called geoengineering "outlandish and unsettling." Could blocking sunlight, for example, impact the Asian monsoon, which 2 billion people depend on for food crops, or alter the oceans' acidity? For geoengineering to be politically feasible, scientists would have to convince ordinary people that it's worth the calculated risk. Last year, Harvard sought to send a balloon into the stratosphere over Tucson in order to release small amounts of calcium carbonate (chalk) to test whether the reflective particles could block some sunlight, but public outcry forced the experiment to be

postponed.

Is safety the only concern?

No. Some climate activists argue that geoengineering serves as a get-out-of-jail-free **panacea** that would allow carbon-emitting corporations to conduct business as usual. They argue that no technological breakthrough would eliminate the long-term need to abandon fossil fuels. Raymond Pierrehumbert, a Nobel Prize–winning professor at Oxford University, compares relying on geoengineering without cutting emissions to "jumping off the Washington Monument and hoping somebody invents anti-gravity before you hit the ground."

Where do most scientists stand?

The global failure to make major emissions cuts is causing many experts to reconsider geoengineering. Compared with the massive financial consequences of global warming, the estimated $2 billion annual price tag to develop solar engineering over 15 years is quite inexpensive. In March, an Australian team conducted one of the world's first geoengineering trials, using 100 nozzles to enhance existing clouds by blasting salt water into the air. In theory, it would take about 1,000 nozzles to save the entire Great Barrier Reef from dying off. "People are right to fear overreliance on techno-fixes," says Harvard professor David Keith. "But there's another nightmare: We realize in hindsight that early use of geoengineering could have saved millions of lives lost in heat waves and helped preserve some of the natural world."

Sucking carbon out of the air

The United Nations' Intergovernmental Panel on Climate Change says the world must remove 1 trillion tons of carbon by 2100 to have any hope of avoiding more than 1.5 degrees Celsius of global warming. A proposed solution, carbon capture, takes two forms: removing CO_2 directly from the emissions of power plants and other industrial facilities or scrubbing it from the atmosphere. At least 19 large-scale projects worldwide are working to capture CO_2 from smokestacks at coal or natural gas plants; such a system was created in 2017 at a Texas coal plant but shut down this May because it captured just 17 percent of emissions, not the targeted 33 percent. The more ambitious plan for carbon capture involves installing pipes to suck carbon from the sky, then store it deep underground. Several companies have developed technology to do just that, but the process remains very expensive. Stripe, a startup company, enables companies and individuals to contribute money to fund carbon removal, as a means of getting the technology off the ground. "This is a hardware problem; it's an infrastructure problem; it's a science problem," Nan Ransohoff, the head of Stripe Climate, told The Atlantic. "It takes a long time to develop carbon removal. This is not Snapchat."

Response option(s):

- After reading the article, what is one main idea that you find most remarkable (meaning, "most worthy of a remark" -- so it can be interesting, concerning, confusing, alarming, offensive, etc)? What is it that you find so remarkable? Explain.
- After reading the article, what additional questions do you have? Research these on your own and write about what you find.
- Summarize any point made in the article and respond.