Transcript for “Plan B”

**Sam Evans-Brown: It’s been a while since we’ve have a dramatic reading… shall we start with a dramatic reading?**

*Report: The climatic changes that may be produced by the increased CO2 content could be deleterious from the point of view of human beings.*

**Sam Evans-Brown: This is the very first government report to mention climate change, submitted to President Lyndon Johnson in 1965.**

*Report: The possibilities of deliberately bringing about countervailing climatic changes therefore need to be thoroughly explored.*

**Sam Evans-Brown: The report lays out the sources of CO — dur… fossil fuels — the possible downsides of global warming — which you know already — and then, without even momentary contemplation of ceasing emissions, pivots directly to this:**

*Report: A change in the radiation balance in the opposite direction to that which might result from the increase of atmospheric CO2 could be produced by raising the albedo, or reflectivity, of the earth. Such a change in albedo could be brought about, for example by spreading very small reflecting Particles over large oceanic areas.*

**Sam Evans-Brown: To be clear, this report is saying: global warming is a problem, yes, BUT TO SOLVE IT, we could just spread something reflective all over the oceans… like glitter, for example ... 5 million square miles of them. That’s less than 4% of the surface area of the world’s salt water. This might be the original sin of geoengineering… reading this makes it feel like we gave up on avoiding climate change before it even really started. The report even estimates what it would cost… and says it would be pretty cheap.**

*Report: Thus a 1 % change in reflectivity might be brought about for about 500 million dollars a year, particularly if the reflecting particles were spread in low latitudes, where the incoming radiation is concentrated. Considering the extraordinary economic and human importance of climate, costs of this magnitude do not seem excessive.*

[mux]

*Gernot Wagner: Why try to address a pollution problem with more pollution? I mean just to be clear that's what this is.*

**Sam Evans-Brown: This is Gernot Wagner — a tricky name to pronounce for Americans.**

*Gernot Wagner: I’m Gernot Wagner. Juggernaut without the Jug.*

**Sam Evans-Brown: Gernot is a co-founder of Harvard’s Solar Geoengineering Research Program. Recently, I spent a couple of days interviewing people from that program, and this story is based largely on those interviews. Geoengineering as in — climate control… it’s the idea that we should deliberately change the world’s climate, even more than we already have, in order to counteract the effect of our carbon emissions.  Not many folks are talking about pouring glitter into the oceans anymore… instead, much of the focus is on the idea that we could deploy a massive fleet of planes all over the world… which would spray tiny reflective particles very high up in the atmosphere.**

**Sam Evans-Brown: But other than that… a lot of the talk is the same.**

*Gernot Wagner: Everything we seem to know about climate policy or you vs. with solar geoengineering. It is so cheap*

**Sam Evans-Brown: What Gernot is saying is that, crazy as that may seem, dimming the sun with tiny particles is much cheaper than the alternatives.**

*Gernot Wagner: literally just the engineering costs of dumping that stuff into the lower stratosphere. cost sort of single digit billions of dollars a year. Relative to the trillions of dollars that unmitigated climate change costs. And relative to the single digit trillions of dollars that it would cost to stop polluting altogether cutting CO2 emissions to zero*

**Sam Evans-Brown: For more than fifty years now, this idea has tickled our imaginations: the allure is that It’s the get-out-of-jail-free card; the ultimate indulgence, sold by the church of technology, for the sins of our inadvertent climate engineering. Of course… a lot of you are probably shouting already… what about the side-effects! But frankly, before we even get to the side-effects, there’s another big problem for this technology.**

*Jane Flegal: This is what I think is so interesting about geoengineering as an emerging… like quote unquote emerging technology is that it’s like not really emerging.*

**Sam Evans-Brown: This is Jane Flegal, a professor at Arizona State University. She says  geoengineering is not really a thing: it’s a hypothesis, which has been tested almost entirely with nothing except computer simulations — climate models — many of which simply turn down how much heat from the sun is coming through the atmosphere, just to see what happens.**

**Sam Evans-Brown: We’re not sure if the engineering of getting the shiny particles up there would actually work, we have a pretty minimal understanding of what the unintended consequences might be, we’re not even sure how long they would actually stay up there in the atmosphere or if they’ll just clump up and fall to earth…It’s all very, very hypothetical.**

*Jane Flegal: We have been stuck at this kind of research impasse for… I mean, I’ve been working on this for a decade, and not much has changed.*

**Sam Evans-Brown: Why the impasse? Why is a technology that was the knee-jerk response to climate change by government scientists more than fifty years ago still in its infancy? Well, because for decades this subject that been verboten. Sure, we were scared of the possible side-effects… but also we were scared of what it would mean if we talked about this too much. The existence of a get-out-of-jail-free card means you’re not worried about going to jail. So maybe geoengineering should stay hypothetical?**

*Jane Flegal: This topic is insane so… giddyup!*

[Outside/In theme Drops]

**Sam Evans-Brown: This is Outside/In, a show about the natural world and how we use it. I’m Sam Evans-Brown Today we’re talking about dealing with climate change by dimming the sun: an idea so fraught that it’s been relegated to the scientific side-lines for fifty years. But as we hurtle towards a substantially warmer world, it’s an idea that’s gotten a lot of attention lately. And even if we might not want to think about it, it’s an idea that we may be stuck with… like it or not.**

[Theme fades]

**Sam Evans-Brown: When we look at environmental problems — plastic in the ocean, overfishing, water quality — the first response is usually that we need to lower our impact on natural systems. But to embrace geoengineering is to embrace the opposite… that if we’ve got our thumb on one side of the scale, we should put the other thumb on the other side of the scale…**

**Sam Evans-Brown: It’s a term that has been used to mean a lot of things, but today, we’re mostly going to be talking about one particular technology: reflecting sunlight by spraying lots of tiny particles into the upper atmosphere to reflect back the sun’s rays. It’s called Solar Radiation Management — a name actually invented to be as boring as possible so that NASA scientists would be allowed to attend conferences about it. And in reality we’re not actually talking about the nuts and bolts of that technology— you can find that on the internet — we’re talking about the ideas that this technology forces us to grapple with.**

**Sam Evans-Brown: If this idea has been around since the sixties or earlier… When did it suddenly get for real? Well, it got a big boost when a high profile essay came out back in 2006.**

*David Keith: Huh, well I heard about it because Steve Schieder who was the author of Climatic Change actually asked me to write one of the commentaries about it but I was too busy and never got around to writing one which I should have done.*

**Sam Evans-Brown: This is David Keith, who has been studying geoengineering since before climate change was the intractable political morass… the late eighties. The essay was by an atmospheric physicist named Paul Crutzen who had helped to draw attention to the growing hole in the ozone and who popularized the term anthropocene — the term that says we’ve changed the world so much that we’ve defined a new geologic era. He said that we should be seriously studying and considering geoengineering.**

*Sam Evans-Brown: So why do you think this one article by this one scientist did matter?*

*David Keith: Uh… I think, well the obvious: because he’s a Nobel Prize winner, he’s a very highly respected figure in the climate science community… and one of the most discussed risks of one kind of solar geoengineering was damage to the ozone layer, and Crutzen was most famous for understanding the chemistry of the ozone layer, so the face that he, who nobody could accuse of not understanding risk to the ozone layer, would say that we should look at this seriously really damped down or made people rethink some of the objections they had.*

[Mux]

**Sam Evans-Brown: Following that 2006 article, research spiked: up  from just a few articles a year in the early aughts to more than 150 a year after 2014. And it was driven mostly by scientists.**

*Holly Buck: First, that I thought it might be economists or politicians or people jazzed about this as kind of a cheap and easy way out who were investigating it, but I found that 70 percent of the assertions made in the media were by scientists*

**This is Holly Buck, a research fellow at UCLA who got interested in all of this geoengineering talk after hearing some conservative economists promoting it**

*Holly buck: And the other thing I found was that only three percent of the assertions about geoengineering were made by women. The other 97 percent it was men describing this, men constructing what it means and explaining what it means to people.*

**Sam Evans-Brown: Why might this be? It’s low-hanging fruit, but also probably a kind of dumb to suggest that there’s something quintessentially masculine about this idea.**

*Holly Buck: Yeah it seems like an easy answer, but I don’t want to have some sort of essentialist ecofeminist perspective that women are naturally more attuned to nature, which may or may not be the case. But I’d like to see a future where women create and use awesome technology too.*

**Sam Evans-Brown: It is also true that reporters are kinda sexist and tend on average to quote male researchers something like five times more often than female ones, but 97 percent? That’s particularly bad. Maybe just as compelling an explanation… this subject was taboo. So the people who are researching this stuff, have to be pretty safe and comfortable: established academic careers, tenured faculty, in hard sciences. Generally speaking, positions that have gone disproportionately to men.**

*Jane Flegal: It’s this very small group, people call it the geoclique.*

**But Jane Flegal points out, this is still a tiny, tiny field.**

*Jane Flegal: So the handful of scientists who really want to see this move forward, who I do think are well intentioned, like I do believe that people believe that this may be a very important tool for managing climate risk..I mean they are also interested in winning scientific prizes, but I um I do believe that people are well meaning… but this relatively small group of actors — scientists — have been trying for a long time now to conjure demand for their research… using whatever tools they can which are largely scientific ones, like here’s a study, here’s a study… but also by advocating explicitly on the hill for more research money etc… and they’ve been remarkably unsuccessful.*

[mux]

*Jane Flegal: And I think it’s because at base the question of whether or not to generate knowledge about this is a values question… so no amount of science is going to resolve it, really.*

**Sam Evans-Brown: So why the taboo? Why is it that—at least for the time being—that this values question has been answered with a lot of squirming in chairs… with squeamishness… with unwillingness to go there?**

**It’s because geoengineering is not actually a solution to climate change. It’s a band-aid… and as Taylor Swift has said, Band-Aids don’t fix bullet holes.**

*Frank Keutsch: I actually usually compare it to people and tell them… well it’s like Opioids.*

**This is Frank Keutsch, another Harvard geoengineering researcher.**

*Frank Keutsch: It’s like these very strong painkillers that have a lot of risk associated with them. And what they do is they usually don’t actually fix the problem. What it does is it lessens symptoms. And the other thing is that ~~y~~ou know it’s a foreign substance that you put in your body that is going to have some toxicity. So it can damage your liver, it can do all kinds of things. And the same thing is true that… the idea that you put a million tons of something into the stratosphere and have no side-effects… is probably a utopia that doesn’t exist.*

**Sam Evans-Brown: You might find yourself saying, right, but painkillers make the pain go away! So why not use them to get rid of the pain?**

*Jane Flegal: from a scientific perspective that makes less than zero sense.*

**Sam Evans-Brown: In reality, you’ve got to address the disease and not the symptoms, so spending research dollars and lavishing media attention on a drug that makes the symptoms go away send the wrong message.**

**Sam Evans-Brown: Especially if, just like some painkillers, the solution might be worse than the disease.**

*Jane Flegal: So if you did So if you did geoengineering, let’s imagine you do sulfate aerosol injection and whatever you spray stuff in the sky you’re blocking the sun  - and in the meantime you continue to emit greenhouse gases… increasing emissions even… you end up in a situation where you have to do more and more and more geoengineering to compensate for the heating effects of the greenhouse gases. Which is an insane thing to do.*

**Sam Evans-Brown: To stick with the analogy, here… imagine dealing with back-pain by just upping the dose of painkillers, while still doing the activity that’s giving you the back pain day-after-day.**

*Jane Flegal: And there is the risk that if the system — if the sociotechnical system that is supplying the geoengineering — fails for whatever reason or stops, you could have rapid onset of warming that was a consequence of the continued emission of greenhouse gases.*

*Sam Evans-Brown: Right there’s a term for this… termination shock!*

**Sam Evans-Brown: If you stop cold turkey, you’ll go through withdrawal… and withdrawal from some drugs can actually kill you.**

[music]

**Sam Evans-Brown: So even just talking about this idea—drawing attention to it—means that some folks who haven’t taken the time to study the nuances will leap to the wrong conclusions.**

*Peter Irvine: Well there's something we call the Super Freakonomics flip.*

**Sam Evans-Brown: This is Peter Irvine. Another gentleman from the geoengineering research squad at Harvard. If somehow you have not heard of it, *Freakonomics* was a book, and its sequel, *Superfreakonomics*, had a section on geoengineering.**

*Peter Irvine: And in their second book they said oh climate change is way too expensive to deal with deal with. Oh but look here's a solar geo engineering idea. It's really cheap. Problem solved. But you know it's kind of climate change isn't a problem. But now that we got something cheap it is it's problem we fixed it. Next. You know that flip is what some people are worried about.*

**Sam Evans-Brown: The lesson of the Freakonomics flip is that folks who are inclined to think climate change is too hard of a problem can quickly pivot to geoengineering. It’s a fantasy: we can have our cake and eat it too… no need to lower carbon emissions… we’ve got shiny particles!**

**Sam Evans-Brown: But here’s the thing: virtually everyone who is studying this technology, believes it should be used ONLY as a stopgap. They think, yeah, painkillers are good for helping you get on with your life while you fix the root cause of your problems, BUT YOU’VE GOT TO FIX THE ROOT CAUSE.  But even though all of the researchers studying this know all of these caveats… the problem is that outsiders \*don’t\*.**

*Gernot Wagner: It does in fact look too good.*

**Sam Evans-Brown: Last year, Gernot Wagner did a study where he estimated the “raw, dumb” engineering costs of what it would take to spray reflective particles into the atmosphere day-after-day, year-after-year, until we’ve reduced emissions. Some hapless, digital news producer at CNN who had never heard of the idea before noticed the study.**

*Gernot Wagner: [00:11:03][5.1] But anyway so he picks up this study somehow. No idea how he found it. And basically writes one of these headlines sort of Harvard scientists discover a solution to climate change kind of thing.*

*Sam Evans-Brown: So I'm just reading here dimming the sun. The answer to global warming. Yes scientists are proposing an ingenious but as yet unproven way to tackle climate change.*

**Sam Evans-Brown: There are lots of side-effects of geoengineering that we aren’t sure about—what will it do to arctic? What will this mean for the Oceans? What will it do to the ozone layer? Gernot Wagner knows that his study doesn’t answer any of those question, he KNOWS that it’s more complicated than just calculating the “raw, dumb” costs… But the public? Not so much. This side-effect… which we might call the silver-bullet problem, is undeniably real. And it happens all the time, because the lay public, journalists, people who are understandably freaked about climate change, love the idea of a quick fix.**

*Gernot Wagner: So this CNN report came out. If you can call it a report came out as of Friday after Thanksgiving. And by Saturday morning s ort of wee hours of Saturday. This study was trending with the Kardashians. So sort of competing with the Kardashians for the number one trending new spot on Twitter for a few hours.  It turns out one of the sisters didn’t spend Thanksgiving with the family and apparently that was a problem. Actually I did spent way too much time on this. She was with her basketball boyfriend or something? Who happens to be playing a game that evening or something, so it wasn’t that she was pissed at her sisters it was because she spent Thanksgiving with her boyfriend, right? Scandal!*

*Sam Evans-Brown: So a somewhat falsified version of a Kardashian story is competing with a somewhat falsified version of the write-up of your study.*

*Gernot Wagner: Exactly, right? And then  you know once Quest Love and no chance the rapper or a parody account for Chance the Rapper are tweeting about your environmental research letters paper right you know that something has gone horribly wrong.*

**Sam Evans-Brown: So as much as the researchers involved might \*want\* this technology to be used in a responsible way — in a way that simply reduces the harm that climate change might cause — the rest of us out here… we’re still looking for that silver bullet. And every new social media intern who learns about this thing and thinks they’ve found that silver bullet, is going to tweet about it as such.**

**Sam Evans-Brown: When a complicated idea is easily misunderstood, it’s going to get misunderstood. And once the narrative gets away from you… it can be hard to get it back.**

**Sam Evans-Brown: After a quick break, a story of a narrative gone wild.**

**[Sponsor Break]**

**Sam Evans-Brown: Welcome back to Outside/In. Today we’re talking about thinking about dimming the sun. An idea that is getting increasingly… mainstream.**

*David Keith: Underneath all the noise and individual headlines and wild claims about how this is all driven by the oil companies or it’s our savior or it’s complete bullshit, there’s actually been a pretty steady movement in the core of the climate science advocacy community to take this topic seriously. It doesn’t mean we should necessarily do it, but the idea that in fact the taboo is wrong.*

**Sam Evans-Brown: This is David Keith, again, one of the original gangsters of solar geoengineering research. David, and a lot of the folks studying this technology think we have to study it… even though they also think it would be preferable if we didn’t have to use it.**

*David Keith: It does make sense to study. It makes sense to study it seriously with all the tools we have of climate science, and to understand how it might be used to reduce climate risks, what it’s risks itself might be and how it should be governed in a divided world. I think there’s actually steady growth of agreement that we should do that work, and yet the press reporting is sort of all driven by the latest headline which doesn’t give people that understanding which I think is important.*

**Sam Evans-Brown: And more to the point… if climate change is really bad, we might need that painkiller. Here’s Josh Horton, Also from Harvard.**

*Josh Horton: But there is still this hope that we can still get things right. I think that that's not right. I think that that that is aspirational. But if you look at the numbers and the trajectories and look at it realistically we're in pretty bad shape and we're going to need some other things to help us get out of this mess.*

**Sam Evans-Brown: If we need the poison pill, and we wind up turning to it, it will be worse if we haven’t thought about whether it works, what the side-effects are, or won’t thought about the best way to govern it…**

**Sam Evans-Brown: Gernot Wagner puts this another way***.*

*Gernot Wagner:  if anything the name of the game now is to stop people countries from doing it too soon too much stupidly.*

**Sam Evans-Brown: And it’s kinda hard to argue with that. More knowledge is good, right? Who would argue for less knowledge? Well, here’s the fear.**

*Penny Chisholm: My name is Penny Chisholm and I am an institute professor at M.I.T. I study microbes in the ocean.*

**Sam Evans-Brown: Over a decade ago , Penny was involved in some of the foundational research that inspired another geoengineering scheme. This one was called Ocean Iron Fertilization.**

*Penny Chisholm: I study phytoplankton in the oceans that are the base of the food web and we study a particular group called prochlorococcus and one of the things that you need to understand about the oceans is what nutrients limit their growth. And at the time there was a hypothesis that iron was an important limiting nutrient.*

**Sam Evans-Brown: This is a little complicated, but the short version of this idea is that if you add just a little bit of iron to certain parts of the ocean, it unlocks the power of this algae, and allows it to grow like crazy.**

*Penny Chisholm: And when you add the limiting nutrient in this case as iron the waters turn green because of these phytoplankton blooms much like in coastal waters.*

**Sam Evans-Brown: But after a quick bloom, these little plants all die, and sink to the bottom of the ocean, carrying with them a whole bunch of carbon dioxide. This relationship was observed by a scientist named John Martin.**

*Penny Chisholm: So he had this throwaway line give me a tanker of iron and I'll give you an ice age and. And because of that. When this experiment was done which was done as a basic research experiment. It was interpreted as a geoengineering experiment. And so it got press coverage and in that way..*

[mux]

**Sam Evans-Brown: That—somewhat unwelcome—press attention, fed on itself.**

*Penny Chisholm: I mean one thing I noticed was it felt like more and more as I tried to articulate the risks and the downsides and the science that we know that people were not factoring in the analysis. It seemed like the more momentum the idea would get.*

**Sam Evans-Brown: The basic science that Penny was involved in doing was showing that this was a REALLY REALLY bad idea. When you add iron, the algae does grow, but then there’s a domino effect.**

*Penny Chisholm:...you're guaranteed certain things...*

**The algae dies, it sinks to the bottom of the ocean, and it starts to break down. Those chemical reactions use up the oxygen that’s in the water, and when the oxygen is gone two things happen: the oceans start producing methane,**

*Penny Chisholm: ..which is a stronger greenhouse gas than carbon dioxide ...*

**and all the fish that need oxygen die. And to cap it all off, even doing this in all the world’s oceans wouldn’t stop global warming.**

*Penny Chisholm:The models show it doesn't have much of an impact whatsoever on the trajectory of global warming.*

[music]

*Penny Chisholm: So there really is nothing that argues that this should be… it shouldn't even be in the portfolio of geoengineering proposals.*

**Sam Evans-Brown: In other words, after some very basic modeling we learned that this particular geoengineering scheme—which is totally different from the spraying stuff into the atmosphere scheme we’ve been talking about so far—was a terrible idea.**

**Sam Evans-Brown: And even though scientists knew that… scientists didn’t get to control how it got talked about.**

*[Dalia Llama: Whether we can really solve this problem or not. When the time comes we have to make attempt. That’s how I feel.*

**Sam Evans-Brown: This is an event that Penny participated in… back in 2012. The Dalai Lama came to Boston, and sat in for a presentation at MIT. Ocean iron was still a pretty hot topic back then, and Penny was asked to present to His Holiness Tenzin Gyatso about why it’s a terrible idea. The whole scene was pretty stilted… she had to work through a translator… time was short… but still, after her shpeal.**

*Dalia Llama: Whether we can really solve this problem or not. When the time comes we have to make attempt. That’s how I feel.*

**Sam Evans-Brown: That’s the Dalai Lama… the Dalai Lama saying we should consider it. The allure of these ideas is powerful. And if they can be misunderstood, they will be.**

*Penny Chisholm: So I. I finally sort of stop. Talking about it for a while to get it off the radar screen.*

*Sam Evans-Brown: Reporters would call you would just be like. No response.*

*Penny Chisholm: I would. Yeah I would say I. I would send them copies of my articles.*

*Sam Evans-Brown: Nothing. Nothing shuts a day turn reporter up quicker than being sent the scientific paper.*

[mux]

**Sam Evans-Brown: So yes… knowledge for knowledge’s sake is good, BUT, you can’t control how people see these silver bullet ideas. And nevermind people - what about governments?  As climate change gets worse, there’s going to be pressure on countries to do something about it… And silver bullets are going to be very very attractive. And while it might be nice to think and talk about systems for global governance that would keep this technology in check... can you really govern something when you can’t even control the narrative?**

*Josh Horton: [00:05:26] So it's how on earth would you get countries to agree. How would you address country's legitimate demands that if something goes wrong they are left out to dry that they get compensated. There are procedures to modify or even to halt geoengineering. And it's not clear that we could resolve that easily and so that's politics it's deciding how things whether things are gonna be done and if so how they're going to do it. Deciding that in a way that's in theory at least inclusive and legitimate and wise and thoughtful and that might be too much to ask for. But that would be the goal.*

*Sam Evans-Brown: I think when you lay it out in all those complexities it it sounds impossible. [00:07:18][6.1]*

*Josh Horton: It's well it may be impossible to do it in an ideal way.*

**[big sigh]**

**Sam Evans-Brown: Just to hammer home the challenge here, one last story. Remember Ocean Iron Fertilization? The geoengineering idea that—once we did some modeling—seemed like it wouldn’t actually work? Well, here’s Penny Chisholm again.**

*Penny Chisholm:  I think it was in 2012. A person named Russ George who actually fertilized. Allegedly. Well he claims to have fertilized ten thousand square mile region of British Columbia. And. Ostensibly to stimulate the salmon fishery there but also to sell carbon credits.*

**Sam Evans-Brown: Just to jump in here, really quickly. For one, it was 10,000 square kilometers not miles… but anyway, this is how this scheme was sold… as a way to generate and sell carbon offsets. And he just went ahead and did it. International waters… didn’t ask permission didn’t tell anyone he was doing it. He just gave it a whirl. And dumped a whole goddamn cargo ship of iron into the freaking ocean.**

*Penny Chisholm: To this day there is no evidence or data from that experiment but yet. It does. Show you what can happen when these ideas are out there it's not hard for a single individual to manipulate ecosystems and on a large scale. When you've figured out what the. What the triggers are.*

**Sam Evans-Brown: I don’t want to make too much of this story. It would actually probably be pretty hard to do actual substantial amounts of geoengineering. If like… one guy tried to do it… world governments could always just sink his ships or shoot down his planes. But what about a superpower… what if things got bad enough for Russia, the US or China to consider it?**

[Music]

**Sam Evans-Brown: So in a way, we’ve become trapped. We’ve pinned ourselves with the allure of our own, possibly flawed, idea.**

*Holly Buck: Because the broader context is that scientists are in a position where their jobs depend on arguing for more research.*

**Sam Evans-Brown: Holly Buck again, from UCLA.**

*Holly Buck: Which is kind of unfortunately true in a lot of situations where research funding is scarce, it’s competitive, they might have to attract money from philanthropists who may really want to be funding something that’s going to be splashy or successful rather than, you know how we think science is supposed to work, you should be free to find some results and if they’re negative, that’s science too. Right. We need those, we need to know those things, and I think the issue kind of one of science being broken.*

*Jane Flegal: Look I am in philanthropy now, and this question about the role of private money in this space is increasingly relevant, and private money does not always mean nefarious money, but you could have like well-meaning philanthropists who get interested in seeing this move forward… and there’s also like private universities and you just… potentially companies I guess, and we don’t have great democratic mechanisms for overseeing that…*

**Sam Evans-Brown: So in a way, just like we as a society are trapped by the allure of this idea, so too are they as scientists. While some universities may fear to tread in this space, others will dive right in, and wealthy, freaked-out climate benefactors will step up to pay for it.**

**In fact, Harvard’s research team will at some point in the near future launch a weather balloon equipped to spray a small amount of calcium carbonate into the stratosphere. A trial which —  unlike the hundreds of pounds of particles we emitted from commercial airliners every moment — will be conducted deliberately.**

**That Geoengineering Research Program? It’s Paid for by tens of millions of private donations… the headlining funder of which is Bill Gates himself… personally.**

[O/I theme drops]

**This episode of Outside/In was produced by me Sam Evans-Brown, with help from Justine Paradis, Taylor Quimby, Hannah McCarthy, Nick Capodice, Samantha Searles and Jimmy Gutierrez.**

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