

The Godfather of Climate Science Turns Up the Heat by David Wallace-Wells. NYT

It is, James Hansen says, worse than you think.

In a [paper](#) published on Thursday and much debated among his colleagues since it was first posted as a preprint last December, Hansen, known as the godfather of climate science, and a group of like-minded colleagues made several alarming claims that all point in the same direction: that the world's climate is significantly more sensitive to carbon emissions than scientists have acknowledged or the public appreciates, and that as a result, even those most focused on climate risks have been systematically underestimating how much warming the planet is likely to see over the next couple of decades.

The more ambitious goal of the Paris Agreement, to limit warming to 1.5 degrees Celsius above preindustrial levels, is “deader than a doornail,” Hansen [said](#) in introducing the paper. The agreement's less ambitious goal, to which the signatories formally agreed, limiting warming to less than two degrees Celsius, is on its deathbed.

The paper, “Global Warming in the Pipeline,” includes long passages of paleoclimate analysis and bursts of sharp big-picture framing, along with high-minded alarm raising and some personal score settling.

“We would be damned fools and bad scientists if we didn't expect an acceleration of global warming,” [he has said](#) in describing its central findings. “One way to deal with this is just to wait,” he told me, since over time, the climate itself will answer our questions about what warming we should have expected. “But in this case, if we do that, young people are screwed. We have got to get this problem understood, or young people are in trouble. We need to get it understood as soon as possible.”

Hansen's 1988 appearance before a Senate committee [conventionally marks](#) the beginning of the era for climate alarm, when many Americans started worrying about global warming and why their leaders were doing so little about it. But in recent years he has played a lonelier role — joining [climate protests and getting arrested](#) well before scientists of his stature felt comfortable doing the same, [advocating](#) an aggressive push into nuclear energy before its recent quasi-embrace by environmentalists and continuing to advocate a carbon price even after most activists and policy wonks decided the idea was impractical or ineffective or some combination of the two.

On the scientific front as well, Hansen, now 82, has been plotting a proudly independent course, warning again and again that warming would be worse than expected and that the scientific community had placed [too much emphasis](#) on climate models rather than direct observation and emphasizing what he has [long called](#) the “Faustian bargain” the

world has made with pollution by aerosols like sulfur dioxide and nitrogen dioxide, which cool the planet even though they are produced largely by the same processes that emit the carbon that warms it.

This [process](#) is already embedded in conventional modeling of our climate future. But the size of the effect is not clear, in part because several decades ago, Hansen lost an argument that NASA should monitor the aerosol effect more directly after a first [attempt failed](#). The United Nations Intergovernmental Panel on Climate Change gives a median estimate of [about 0.5 degrees](#) Celsius of cooling — significant, though small enough that a drop in its impact could be reliably offset by rapid reductions in methane, another greenhouse gas. But the uncertainty range is much higher for aerosol cooling than for other, more widely measured climate inputs, and the high end of that estimated range is above a full degree of cooling.

In the “Pipeline” paper, Hansen gives a higher estimate still: that aerosols are cooling the planet by perhaps 1.5 degrees Celsius. And because the world is moving away from air pollution much faster than it is moving away from carbon emissions, he suggests that the bill for that Faustian bargain is about to come due and that as a result, the rate of warming will grow by [50 to 100 percent](#) over the next few decades.

These are only two of a number of contested claims the “Pipeline” paper puts forward; others are that a large sea-level rise this century will be much greater than the I.P.C.C. assumes and that a collapse of one of the oceans’ major circulation systems is possible this century, much sooner than most believe.

In the year since it was first posted as a preprint, the paper has generated considerable skepticism and criticism from many fellow scientists, who invariably praise Hansen in principle before raising questions about his new paper. On the rhetorical side, critics have raised issues with [the phrase](#) “in the pipeline,” pointing out that recent research suggests that, contrary to earlier conventional wisdom, when carbon emissions stop, most warming will, too, and in short order.

And while some scientists have also [taken issue](#) with the paper’s claim that warming is accelerating, others, including the authors of an authoritative [“state of the climate”](#) review, [have also detected an acceleration](#). And while the paper’s warming timeline has attracted considerable attention — predicting that we may cross the 1.5 degree threshold in the next few years and the two degree threshold in the next few decades — others have [pointed out](#) that those predictions are, in fact, quite close to the I.P.C.C.’s best guesses for what current policy emission trajectories will yield.

The headline proposition of “Pipeline” concerns something called equilibrium climate sensitivity, often called E.C.S., an estimate of how much the planet would warm if global carbon dioxide levels double from the preindustrial average. To this point, we have elevated those levels by [almost exactly](#) 50 percent. For decades, the central estimate for E.C.S. has been [three degrees Celsius](#); double carbon dioxide, and you get three degrees

of warming. Working primarily from a new understanding of the cooling dynamics between ice ages, Hansen and his co-authors calculate it as 4.8 degrees Celsius.

At first blush, this looks like a major revision. But all of those estimates come with notoriously large uncertainty ranges, and the 4.8 degree estimate in “Pipeline” falls just within or just outside many of those uncertainty ranges. For instance, [one authoritative review](#), published in 2020, estimated with 90 percent confidence that E.C.S. was between 2.3 and 4.7 degrees Celsius. The most recent I.P.C.C. report gave a 90 percent range of [three to five degrees Celsius](#). And taking that range seriously means taking seriously the possibility that Hansen’s alarming new estimate is right — perhaps even [rather mainstream](#).

This all may sound quite technical, but if the world decarbonizes pretty rapidly, different climate sensitivities could mean the difference between two degrees Celsius of warming and three, and if we decarbonize more slowly, that could make the difference between three and four. Given that scientists have taken care, over the past decade, to emphasize that every tenth of a degree matters, uncertainties of this scale surely matter enormously.

The debate also teaches that for all we have advanced our understanding of the earth in recent decades, an awful lot about the climate future remains unsure. Over the decades, climate scientists have talked about these risks in a variety of ways, invoking the precautionary principle or emphasizing the [fat-tail risks](#) of unlikely catastrophic surprises. Others have used a more colorful phrase to describe these potential risks: the [monsters behind the door](#).