



## Every Rock Has a Story & The Rock Whisperer

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**C**hildren should be introduced to our remarkable planet while young, when their curiosity is easily stoked. If you have young ones ready to sit still for 6-9 minutes, I heartily recommend the series [Every Rock Has a Story](#) by Boston College Prof. Ethan Baxter. It is excellent for inspiring wonder and curiosity, and for introducing the scientific method, how scientists try things, make mistakes, and learn from them. Children will be comfortable with Ethan, who has a lot in common with Mr. Rogers. Parents can check his 19-minute [teacher/parent guide](#).

Curiously, at almost exactly the same moment that I received an e-mail from Ethan Baxter, I received one from the Rock Whisperer, my friend Paul Hearty, with a copy of his current paper<sup>1</sup> on rocks in South Africa. He and co-authors show that in the Mid-Pliocene (about 3 million years ago), when atmospheric CO<sub>2</sub> was about the same as today, it was a few degrees warmer and sea level was 15-30 meters higher (50-100 feet). One of Paul's co-authors is Maureen Raymo, the new Director of Columbia's Lamont-Doherty Earth Observatory, who dubbed Paul the Rock Whisperer for his remarkable ability to read the story in the rocks.

In 2006, when I was concerned that the IPCC projections of sea level rise were unrealistically conservative, I suspected that something was wrong with the ocean models that IPCC relied on. For one thing, the models did not properly include the cooling effect of ice melt on the North Atlantic and Southern Oceans. So, we ran climate simulations with our coarse-resolution global model, and were startled by the result: we found that the world was on the verge of shutting down both the Southern Ocean and North Atlantic overturning circulations, with enormous potential consequences for future sea level, because of amplifying feedbacks for Antarctic ice.

This would be a hard story to sell, given the coarse resolution of our model, and the fact that our result seemed to differ from all the other models. And why did Earth's history not reveal such rapid feedback-driven change in the past? That's when I discovered the papers of Paul Hearty for the last interglacial period, the Eemian, about 120,000 years ago, when global temperature reached levels perhaps as much as 1-2°C warmer than the preindustrial (1880-1920) level.

Hearty's reading of the rocks painted a picture of the Eemian that was consistent with what we were finding in our climate modeling. We needed to develop that story, so we started to work with Paul Hearty, but first we needed an explanation for what was wrong with the ocean models.

The most crucial information about the ocean models was provided by observations of heat uptake by the oceans. Here the expert, the ocean heat whisperer if there is such a thing, was a young post-doc, Karina von Schuckmann, with whom we began to collaborate in about 2010.

When we published the paper *Ice Melt, Sea Level Rise and Superstorms*<sup>2</sup> it was greeted by some in the community in the same way that our 1981 paper in *Science*<sup>3</sup> and my 1988 congressional testimony<sup>4</sup> were greeted. Seth Borenstein, lead science writer for the Associated Press, was told by five of his six top climate science experts that he should not even write about this paper, and he did not. This year we have obtained strong confirming evidence of the principal conclusions of our paper. Because I am within months of finishing *Sophie's Planet*, I will describe the results first in the book.

Speaking of rocks, the 1,000 ton boulder that Anniek is standing beside in the photo was washed up to the top of a hill on Eleuthera by waves from a powerful storm, aided by a higher sea level. That story will be in the book.

There is still a lot of hard science to do. How much time do we have to make the changes that are needed to avoid catastrophic outcomes, such as unacceptably large sea level rise? What are the most effective actions? Panic is counterproductive. Plenty to discuss.

Finally, I apologize for the slightly flippant paragraph that I added at the end of Chapter 23, which some people found to be confusing. It was a bit of an insider comment meant to refer to my bad decision to 1981 to move GISS into NASA Earth Sciences, rather than NASA Space Sciences. I will fix that paragraph to clarify the story.

You can sign up for our monthly global temperature updates [here](#).

You can sign up for my other Communications [here](#).

I opened a Twitter account @DrJamesEHansen, (<https://twitter.com/drjamesehansen>), but I am focusing mainly on finishing the book.

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<sup>1</sup> Hearty, P.J., A Rovere, M.R. Sandstrom, M.J. O'Leary, D. Roberts and M.E. Raymo: [Pliocene-Pleistocene stratigraphy and sea-level estimates, Republic of South Africa with implications for a 400 ppmv CO<sub>2</sub> world](#), *Paleocean. Paleoclim*, 35, e2019PA003835.

<sup>2</sup> Hansen, J., M. Sato, P. Hearty, R. Ruedy, M. Kelley, V. Masson-Delmotte, G. Russell, G. Tselioudis, J. Cao, E. Rignot, I. Velicogna, B. Tormey, B. Donovan, E. Kandiano, K. von Schuckmann, P. Kharecha, A.N. Legrande, M. Bauer, and K.-W. Lo: [Ice melt, sea level rise and superstorms: evidence from paleoclimate data, climate modeling, and modern observations that 2 C global warming could be dangerous](#) *Atmos. Chem. Phys.*, **16**, 3761-3812, 2016.

<sup>3</sup> Hansen, J., D. Johnson, A. Lacis, S. Lebedeff, P. Lee, D. Rind, and G. Russell: [Climate impact of increasing atmospheric carbon dioxide](#). *Science*, **213**, 957-966, 1981.

<sup>4</sup> Kerr, R.A.: [Hansen vs. the world on the greenhouse threat](#), *Science*, 244, 1041-1043, 1989.