

# Could an Industrial Prehuman Civilization Have Existed on Earth Before Ours?

A provocative new paper suggests some ways to find out<sup>1</sup>

By [Steven Ashley](#) on April 23, 2018

Credit: [Michael Osadciw University of Rochester](#)

One of the creepier conclusions drawn by scientists studying the Anthropocene—



the proposed epoch of Earth's geologic history in which humankind's activities dominate the globe—is how closely

<sup>1</sup> Source: <https://www.scientificamerican.com/article/could-an-industrial-prehuman-civilization-have-existed-on-earth-before-ours>

today's industrially induced climate change resembles conditions seen in past periods of rapid temperature rise.

“These ‘hyperthermals,’ the thermal-maximum events of prehistory, are the genesis of this research,” says Gavin Schmidt, climate modeler and director of the NASA Goddard Institute for Space Studies. “Whether the warming was caused by humans or by natural forces, the fingerprints—the chemical signals and tracers that give evidence of what happened then—look very similar.”

The canonical example of a hyperthermal is the Paleocene–Eocene Thermal Maximum (PETM), a 200,000-

year period that occurred some 55.5 million years ago when global average temperatures rose by 5 to 8 degrees Celsius (about 9 to 14 degrees Fahrenheit). Schmidt has pondered the PETM for his entire career, and it was on his mind one day in his office last year when the University of Rochester astrophysicist Adam Frank paid him a visit.

Frank was there to discuss the idea of studying global warming from an “astrobiological perspective”—that is, investigating whether the rise of an alien industrial civilization on an exoplanet might necessarily trigger climate

changes similar to those we see during Earth's own Anthropocene. But almost before Frank could describe how one might search for the climatic effects of industrial "exocivilizations" on newly discovered planets, Schmidt caught him up short with a surprising question: "How do you know we're the only time there's been a civilization on our own planet?"

Frank considered a moment before responding with a question of his own: "Could we even tell if there had been an industrial civilization [long before this one]?"

Their subsequent attempt to address both questions has yielded a provocative paper on the possibility Earth might have spawned more than one technological society during its 4.5-billion-year history. And if indeed some such culture arose on Earth in the murky depths of geologic time, how might scientists today discern signs of that incredible development? Or, as the paper put it: “If an industrial civilization had existed on Earth many millions of years prior to our own era, what traces would it have left and would they be detectable today?” Schmidt and Frank began by forecasting the geologic fingerprints the

Anthropocene will likely leave behind—such as hints of soaring temperatures and rising seas laid down in beds of sedimentary rock. These features, they noted, are very similar to the geologic leftovers of the PETM and other hyperthermal events. They then considered what tests could plausibly distinguish an industrial cause from otherwise naturally occurring climate changes. “These issues have never really been addressed to any great extent,” Schmidt notes. And that goes not only for scientists, but evidently for science fiction writers as well, he adds: “I looked back into the science fiction literature to

try to find the earliest example of a story featuring a nonhuman industrial civilization on Earth. The earliest I could find was in a *Doctor Who* episode.”

That 1970 episode of the classic TV series involves the present-day discovery of “Silurians”—an ancient race of technologically advanced, reptilian humanoids who predated the arrival of humans by hundreds of millions of years. According to the plot, these highly civilized saurians flourished for centuries until Earth’s atmosphere entered a period of cataclysmic upheaval that forced *Homo reptilia* to go into hibernation underground to wait out the

danger. Schmidt and Frank paid tribute to the episode in the title of their paper: “The Silurian Hypothesis.”

## **Lost in Strata**

Any plausibility for the Silurian hypothesis stems chiefly from the vast incompleteness of the geologic record, which only gets sparser the farther back in time you go.

Today, less than 1 percent of Earth’s surface is urbanized, and the chance that any of our great cities would remain over tens of millions of years is vanishingly low, says Jan Zalasiewicz, a geologist at the University of Leicester in England. A metropolis’s ultimate fate, he notes,



mostly depends on whether the surrounding surface is subsiding (to be locked in rock) or rising (to be eroded away by rain and wind). “New Orleans is sinking; San Francisco is rising,” he says. The French Quarter, it seems, has much better chances of entering the geologic record than Haight–Ashbury. “To estimate the odds of finding artifacts,” Schmidt says, “The back-of-the-envelope calculation for dinosaur fossils says that one fossil emerges every 10,000 years.” Dinosaur footprints are rarer still.

“After a couple of million years,” Frank says, “the chances are that any physical

reminder of your civilization has vanished, so you have to search for things like sedimentary anomalies or isotopic ratios that look off.” The shadows of many prehuman civilizations could, in principle, lurk hidden in such subtleties.

But exactly what we would look for depends to some degree on how an Earthly-but-alien technological culture would choose to behave. Schmidt and Frank decided the safest assumption to make would be that any industrial civilization now or hundreds of millions of years ago should be hungry for energy. Which means any ancient

industrial society would develop the capacity to widely exploit fossil fuels as well as other power sources, just as we have today. “We’d be looking for globalized effects that would leave a worldwide trace”—planetary-scale physical-chemical tracers of energy-intensive industrial processes and their wastes, Schmidt says.

Next comes the issue of longevity—the longer a civilization’s energy-intensive period persists and grows, the more obvious its presence should become in the geologic record. Consider our own industrial age, which has only existed for about 300 years out of a multimillion-

year history of humanity. Now compare that minuscule slice of time with the half-billion years or so that creatures have lived on land. Humanity's present rapacious phase of fossil fuel use and environmental degradation, Frank says, is unsustainable for long periods. In time it will diminish either by human choice or by the force of nature, making the Anthropocene less of an enduring era and more of a blip in the geologic record. "Maybe [civilization like ours] has happened multiple times, but if they each only last 300 years, no one would ever see it," Frank says.

Taking all this into consideration, what remains is a menu of diffuse long-lived tracers including fossil fuel combustion residues (carbon, primarily), evidence of mass extinctions, plastic pollutants, synthetic chemical compounds not found in nature and even transuranic isotopes from nuclear fission. In other words, what we would need to look for in the geologic record are the same distinctive signals that humans are laying down right now.

## **Signs of Civilization**

Finding signs of an altered carbon cycle would be one big clue to previous industrial periods, Schmidt says. “Since

the mid–18th century, humans have released a half-trillion tons of fossil carbon at high rates. Such changes are detectable in changes in the carbon isotope ratio between biological and inorganic carbon—that is, between the carbon incorporated into things like seashells and that which goes instead into lifeless volcanic rock.”

Another tracer would be distinctive patterns of sediment deposition. Large coastal deltas would hint at boosted levels of erosion and rivers (or engineered canals) swollen from increased rainfall. Telltale traces of nitrogen in the sediments could suggest

the widespread use of fertilizer, fingering industrial-scale agriculture as a possible culprit; spikes in metal levels in the sediments might instead point to runoff from manufacturing and other heavy industry.

More unique, specific tracers would be non-naturally occurring, stable synthetic molecules such as steroids and many plastics, along with well-known pollutants including PCBs—toxic polychlorinated biphenyls from electrical devices—and CFCs—ozone-eating chlorofluorocarbons from refrigerators and aerosol sprays.

The key strategy in distinguishing the presence of industry from nature, Schmidt notes, is developing a multifactor signature. Absent artifacts or convincingly clear markers, the uniqueness of an event may well be seen in many relatively independent fingerprints as opposed to the coherent set of changes that are seen to be associated with a single geophysical cause.

“I find it amazing that no one had worked all this out before, and I’m really glad that somebody has taken a closer look at it,” says Pennsylvania State University astronomer Jason Wright,



who last year published “[a fluffy little paper](#)” exploring the counterintuitive notion that the best place to find evidence of any of Earth’s putative prehuman civilizations may well be off-world. If, for instance, dinosaurs built interplanetary rockets, presumably some remnants of that activity might remain preserved in stable orbits or on the surfaces of more geologically inert celestial bodies such as the moon.

“Look, 200 years ago the question of whether there might be a civilization on Mars was a legitimate one,” Wright says.

“But once the pictures came out from interplanetary probes, that was settled

for good. And that view became ingrained, so now it's not a valid topic for scientific inquiry; it's considered ridiculous. But no one's ever put the actual scientific limits on it—on what may have happened a long time ago.” Wright also acknowledges the potential for this work to be misinterpreted. “Of course, no matter what, this is going to be interpreted as ‘Astronomers Say Silurians Might Have Existed,’ even though the premise of this work is that there is no such evidence,” he says. “Then again, absence of evidence is not evidence of absence.”