

The geology of the planet**Welcome to the Anthropocene**

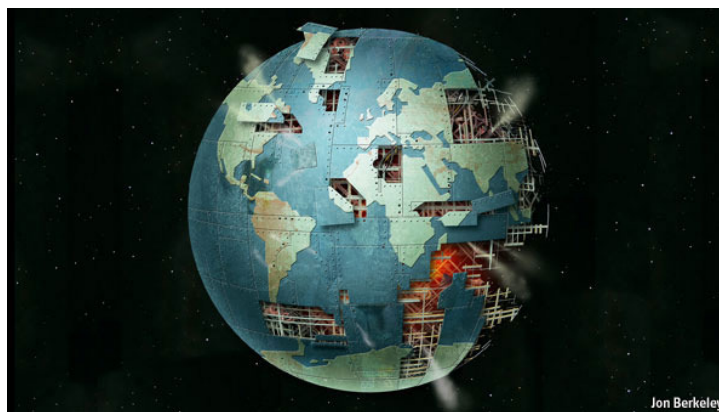
Humans have changed the way the world works. Now they have to change the way they think about it, too

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THE Earth is a big thing; if you divided it up evenly among its 7 billion inhabitants, they would get almost 1 trillion tonnes each. To think that the workings of so vast an entity could be lastingly changed by a species that has been scampering across its surface for less than 1% of 1% of its history seems, on the face of it, absurd. But it is not. Humans have become a force of nature reshaping the planet on a geological scale—but at a far-faster-than-geological speed.



A single engineering project, the Syncrude mine in the Athabasca tar sands, involves moving 30 billion tonnes of earth—twice the amount of sediment that flows down all the rivers in the world in a year. That sediment flow itself, meanwhile, is shrinking; almost 50,000 large dams have over the past half-century cut the flow by nearly a fifth. That is one reason why the Earth's deltas, home to hundreds of millions of people, are eroding away faster than they can be replenished.

Geologists care about sediments, hammering away at them to uncover what they have to say about the past—especially the huge spans of time as the Earth passes from one geological period to another. In the same spirit they look at the distribution of fossils, at the traces of glaciers and sea-level rises, and at other tokens of the forces that have shaped the planet. Now a number of these scientists are arguing that future geologists observing this moment in the Earth's progress will conclude that something very odd was going on.

The carbon cycle (and the global warming debate) is part of this change. So too is the nitrogen cycle, which converts pure nitrogen from the air into useful chemicals, and which mankind has helped speed up by over 150%. They and a host of other previously natural processes have been interrupted, refashioned and, most of all, accelerated (see [article](#)). Scientists are increasingly using a new name for this new period. Rather than placing us still in the Holocene, a peculiarly stable era that began only around 10,000 years ago, the geologists say we are already living in the Anthropocene: the age of man.

The new geology leaves all in doubt

What geologists choose to call a period of history normally matters little to the rest of mankind; tussles at the International Commission on Stratigraphy over the boundaries of the

Ordovician era do not normally capture headlines. The Anthropocene is different. It is one of those moments where a scientific realisation, like Copernicus grasping that the Earth goes round the sun, could fundamentally change people's view of things far beyond science. It means more than rewriting some textbooks. It means thinking afresh about the relationship between people and their world and acting accordingly.

Thinking afresh is the easier bit. Too many natural scientists embrace the comforting assumption that nature can be studied, indeed should be studied, in isolation from the human world, with people as mere observers. Many environmentalists—especially those in the American tradition inspired by Henry David Thoreau—believe that “in wilderness is the preservation of the world”. But the wilderness, for good or ill, is increasingly irrelevant.

Almost 90% of the world's plant activity, by some estimates, is to be found in ecosystems where humans play a significant role. Although farms have changed the world for millennia, the Anthropocene advent of fossil fuels, scientific breeding and, most of all, artificial nitrogen fertiliser has vastly increased agriculture's power. The relevance of wilderness to our world has shrunk in the face of this onslaught. The sheer amount of biomass now walking around the planet in the form of humans and livestock handily outweighs that of all other large animals. The world's ecosystems are dominated by an increasingly homogenous and limited suite of cosmopolitan crops, livestock and creatures that get on well in environments dominated by humans. Creatures less useful or adaptable get short shrift: the extinction rate is running far higher than during normal geological periods.

Recycling the planet

How frightened should people be about this? It would be odd not to be worried. The planet's history contains many less stable and clement eras than the Holocene. Who is to say that human action might not tip the planet into new instability?

Some will want simply to put the clock back. But returning to the way things were is neither realistic nor morally tenable. A planet that could soon be supporting as many as 10 billion human beings has to work differently from the one that held 1 billion people, mostly peasants, 200 years ago. The challenge of the Anthropocene is to use human ingenuity to set things up so that the planet can accomplish its 21st-century task.

Increasing the planet's resilience will probably involve a few dramatic changes and a lot of fiddling. An example of the former could be geoengineering. Today the copious carbon dioxide emitted to the atmosphere is left for nature to pick up, which it cannot do fast enough. Although the technologies are still nascent, the idea that humans might help remove carbon from the skies as well as put it there is a reasonable Anthropocene expectation; it wouldn't stop climate change any time soon, but it might shorten its lease, and reduce the changes in ocean chemistry that excess carbon brings about.

More often the answer will be fiddling—finding ways to apply human muscle with the grain of nature, rather than against it, and help it in its inbuilt tendency to recycle things. Human interference in the nitrogen cycle has made far more nitrogen available to plants and animals; it has done much less to help the planet deal with all that nitrogen when they have finished with it. Instead we suffer ever more coastal “dead zones” overrun by nitrogen-fed algal blooms. Quite small things, such as smarter farming and better sewage treatment, could help a lot.

For humans to be intimately involved in many interconnected processes at a planetary scale carries huge risks. But it is possible to add to the planet's resilience, often through simple and piecemeal actions, if they are well thought through. And one of the messages of the Anthropocene is that piecemeal actions can quickly add up to planetary change.

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