

A world of our making

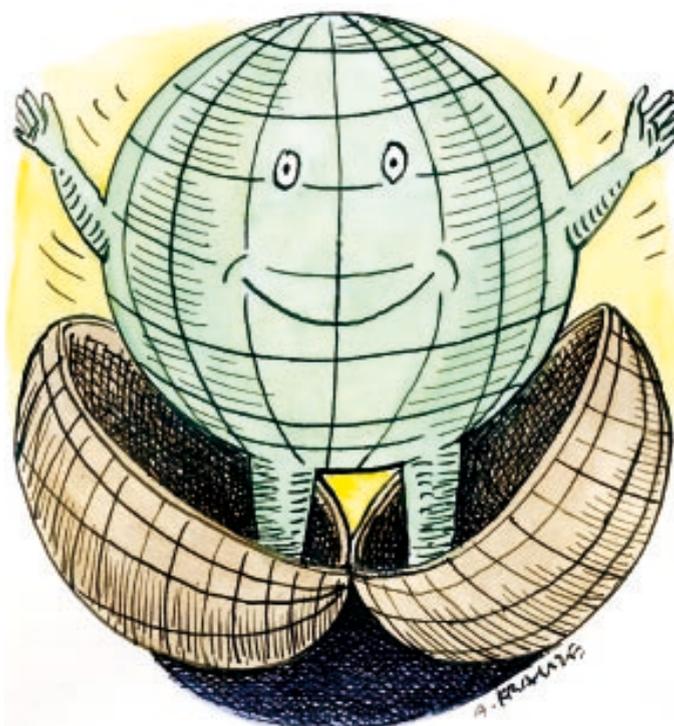
Humans have transformed Earth beyond recovery – but rather than look back in despair we should look ahead to what we can achieve, says **Erle C. Ellis**

THE Holocene, with its mild climate so remarkably stable and good for us, is over. We humans have transformed Earth's climate, geology, biology and hydrology so extensively, profoundly and permanently that geologists are proposing the formal designation of a new geological epoch: the Anthropocene.

International scientific panels will ultimately decide whether to recognise the new epoch, and it could be a decade or longer before we get a final ruling. Nevertheless, it's high time that we – and I do mean all of us – take stock of the new Earth we have created. One reason to do this is to help answer a basic geological question: will the Anthropocene last long enough to justify its designation as a new epoch, or will it remain a mere geological event akin to the impact of an asteroid? It will also help us answer a more profound question: what do we do now?

The first lesson of history is simple: the Anthropocene was a long time in the making. Significant human alteration of the biosphere began more than 15,000 years ago as Palaeolithic tribes evolved social learning, advanced hunting and foraging technologies, and the use of fire, and used them to open up forested landscapes and kill off megafauna.

These Palaeolithic human impacts were significant and extensive, but they were minor compared with the impact of the rise of agriculture more than 8000 years ago. By domesticating plant and animal species and engineering ecosystems to



support them, humans introduced a wide range of unambiguously anthropogenic processes into the biosphere.

Human alteration of Earth systems tends to be far more extensive and complex than one would expect based on numbers alone. Even 8000 years ago, with a population of just 10 million or so, humans had already altered as much as a fifth of Earth's ice-free land, primarily by using fire to clear forest. The reason small populations had such extensive impacts is that early agriculture emphasised labour efficiency. Early farmers did not use the plough, and that meant constantly shifting cultivation

more intensively transformed anthromes by tillage, irrigation, manuring and cropping. By 1750, more than half of the terrestrial biosphere had been converted into anthromes, leaving an ever greater permanent record in soils, sediments and the atmosphere. This process ultimately gave rise to the densely populated village and urban anthromes most of us live in today.

The rise of industrial systems in the past century has transformed the majority of the terrestrial biosphere into intensively used anthromes dominated by novel ecological processes. Now more than 7 billion strong and growing, we continue to transform the last wild biomes into anthromes – a process that must end soon as we reach the limits of the usable biosphere. Already, more than 12 per cent of Earth's ice-free land is used continuously for crops and 16 per cent for livestock.

Thus we find ourselves in the Anthropocene. Today, even if the population were to decline substantially or land use to become far more efficient, the extent, duration and intensity of human activity has altered the terrestrial biosphere sufficiently to leave an unambiguous geological record differing substantially from that of any prior epoch. Earth's biodiversity, biogeochemistry and evolution are now profoundly reshaped by us – and are therefore in our hands.

There will be no returning to our comfortable cradle. The global patterns of the Holocene have receded and their return is no

to the most fertile areas. As a result, most of the landscape was in some stage of recovery, giving rise to “semi-natural” woodlands. These were among the first anthropogenic biomes, or “anthromes”.

In this way, human populations were able to increase and expand for millennia, converting vast tracts of pristine forest into semi-natural woodlands and less productive land into rangeland. As populations grew larger and more dense they created ever

“The global patterns of the Holocene have receded and their return is not possible or even desirable”

longer possible, sustainable or even desirable. It is no longer Mother Nature who will care for us, but us who must care for her.

This raises an important but often neglected question: can we create a good Anthropocene? In the distant future will we be able to look back with pride?

We have seen what we can do, and it is awesome. In just a few millennia, humanity has emerged as a global force of nature – a networked system of billions of individuals creating and sustaining an entirely new global ecology. We live longer than ever, and our average standard of living has never been higher. These unprecedented achievements clearly demonstrate the remarkable ability of our social systems and technologies to evolve and adapt, often to changes we ourselves have induced.

Yet it is also easy to see what we have lost and are even now destroying. Wild fish and forests are nearly gone. We are warming the atmosphere, melting the ice caps, acidifying the ocean, polluting land and sea, driving species to extinction and inducing invasions by species from around the world – and in some areas leaving only a wasteland of monocultures and weeds.

Clearly it is possible to look at all we have created and see only what we have destroyed.

But that, in my view, would be our mistake. We most certainly can create a better Anthropocene. We have really only just begun, and our knowledge and power have never been greater. We will need to work together with each other and the planet in novel ways. The first step will be in our own minds. The Holocene is gone. In the Anthropocene we are the creators, engineers and permanent global stewards of a sustainable human nature. ■

Erle C. Ellis is an associate professor in the department of geography and environmental systems at the University of Maryland, Baltimore County

One minute with... Robin Ince

Britain's funniest geek celebrates the amusement he finds in seeing the world through godless eyes

You're been dubbed an uber-geek. How do you feel about that?

I have faced up to what I am. Once you start looking at the world rationally, it becomes much more exciting. For instance, I find the idea that all of my atoms have been jiggling around in other things for billions of years satisfying – it's my own sense of reincarnation.

How do people of faith regard your viewpoint?

Religious people often accuse my radio show *Infinite Monkey Cage* of evangelising, which I quite enjoy. Perhaps we should elevate it to a prayer versus penicillin debate. In fact, I sometimes think: "Oh alright, why don't we make science like a religion. Here's a statue of Einstein, now fall prostrate and worship it if that's what you want, if that is the misunderstanding you prefer."

One idea I explore in my stand-up show is whether, if you try looking at the universe rationally and avoid coping mechanisms like mysticism or religion, you can still be happy knowing you are going to die after a brief time on this spinning ball.

Doesn't looking at the world in a totally rational way make life a bit harder, existentially speaking?

I am not offering an alternative to religion. Wherever you are on Earth, there is more life present than in the rest of the known universe. That is an exciting thought which brings you back to Carl Sagan's description of the world as a pale blue dot in the vastness of space, and the idea that life is precious. And the "many worlds" theory of quantum physics gives you so many different options. This is the world I live in now, but there's the world where I accidentally killed the dog, and one where I saved it.

As a humanist, do you feel robbed of an afterlife?

There is usually so much wailing at a funeral that I am beginning to wonder how many people really believe in an afterlife. I don't. Death is a kick up the backside. I will, say, live till I'm 80 years old. I am



PROFILE

Comedian Robin Ince presents the BBC radio show *Infinite Monkey Cage* with physicist Brian Cox. He is appearing at the Cheltenham Science Festival, which runs from 7 to 12 June in Cheltenham, UK

50 per cent through already and I want to live as good a life as possible because my consciousness will one day come to an end. I want to fit in as much as I can before it switches off.

You seem to be on a mission to geekify the UK. Why?

I think it is a pity to live your life in ignorance and embrace that ignorance – for instance with ideas like intelligent design. We live in a world that is entirely powered by reason: everything in your office and my house exists because of reason. It is a very odd world where people reject reason and yet benefit from the riches of reason.

Einstein or Darwin – which do you most admire?

I love the Englishness of Darwin, the sweetness of his character. He was a man without arrogance who overturned our view of how all living things came to be as they are, and because of that he suffered fear, doubt and frequent tummy aches.

Interview by Roger Highfield