The century-long study of ice, a historian says, reveals "the cumulative, insidious, all-pervading power of people on Earth."

trapped within it—"is the key to understanding climate change," writes Tom Griffiths, a historian at the Australian National University in Canberra (and no relation to the *GriffithREVIEW*'s namesake).

The first inklings of the role ice has played in shaping the world emerged in the late 1830s, when Swiss-born scientist Louis Agassiz postulated that large sheets of ice once covered much of the globe. Decades passed before this idea gained wide acceptance. In 1859, Irish researcher John Tyndall went poking into the causes of the Ice Age, examining the gases in the atmosphere to see if they all behaved the same way. He found that not all atmospheric gases are transparent to radiant heat—in particular, carbon dioxide ($C0_2$) is opaque—which means that fluctuations in the amount of $C0_2$ in the atmosphere could affect how the earth heats and cools. One and a half centuries ago, the role of greenhouse gases in setting the earth's temperature was flagged. What we know about climate and global warming today began with efforts to understand the climate of eras past and the glaciers that once covered large swaths of Europe.

Griffiths is quick to point out that nothing in the first century of climate research supports the sinister, left-wing conspiracy many global warming skeptics imagine. When scientists did raise the possibility of global warming, "they saw it mostly as positive. . . . Indeed, if the world were warmer, it might make winters more comfortable and agriculture more productive, or even help stave off the next Ice Age. For the first two-thirds of the 20th century the global warming trend was called the 'embetterment' of climate, or the 'recent amelioration.'"

It wasn't until very recently that scientists began to recognize the peril posed by global temperature fluctuation. There were two key discoveries. First, in the early 1980s, scientists studying the Greenland ice sheet found that climate change had occurred much more quickly than they had assumed was likely, sometimes as much as five or six degrees Celsius within a few decades. Second, the levels of $C0_2$ in the atmosphere today are higher than at any time in at least 400,000 years, as indicated by archived ice cores from Antarctica.

Until now, major scientific discoveries have invariably established that humans are less than central actors in the physical world. Copernicus upended the notion that the sun revolves around Earth; geologists and biologists have demonstrated the incredibly recent appearance of Homo sapiens on the planet. By contrast, the century-long study of ice reveals "the cumulative, insidious, all-pervading power of people on Earth," Griffiths observes.

SCIENCE & TECHNOLOGY

Cloning the Neanderthals

THE SOURCE: "Should We Clone Neanderthals?" by Zach Zorich, in ***Archaeology***, March–April 2010.

Nearly 50,000 years ago in northern Spain, 11 Neanderthals were murdered. The circumstances remain mysterious, but the evidence—1,700 broken bones—is today providing scientists with many clues about what color hair Neanderthals had (red), what their skin looked like (pale), and whether they spoke (probably). It's possible that in due time, DNA extracted from those bones or those of another Neanderthal will be implanted in a cell, that cell will be coaxed into multiplying, and, with the right techniques and no shortage of luck, the result will be a living, breathing Neanderthal. Such an achievement will "force the field of paleoanthropology into some unfamiliar ethical territory," writes Zach Zorich, a senior editor at *Archaeology*.

Neanderthals are modern humans' closest extinct relative, having branched off from our line of the family tree some 450,000 years ago. Locked in their DNA could be priceless information for scientists studying diseases that are "largely human-specific, such as HIV, polio, and smallpox." If Neanderthals turn out to be genetically immune to such ailments, it's possible that studying their DNA could lead to gene therapy treatments. But for scientists interested in cloning a Neanderthal, technical hurdles stand in the way. A

A technician touches his drill to a piece of fossilized Neanderthal bone as part of the Neanderthal genome project at the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany.

stitched-together genome (since no intact ones exist) would likely be full of errors, and to make it, scientists would have to take several samples, destroying rare bones in the process. One method of cloning—nuclear transfer—tends to produce many sickly organisms that often die. Perfecting the process would "require a horrifying period of trial and error," Zorich explains. Another method—using stem cells—has so far only been tested in mice.

Even if scientists are one day able to clone a Neanderthal, the resulting being would lack "the environmental and cultural factors that would have influenced how the original Neanderthals grew up." One scientist says that the clones would be no more than "neo-Neanderthals."

Bernard Rollin, a bioethicist and professor of philosophy at Colorado State University, doesn't believe that cloning a Neanderthal would be a problem—the issue, he says, is how that clone would be treated once he or she was brought into the world. Would a clone have human rights under the Constitution and international law? How much of a genome needs to be changed before someone is not considered human? Moreover, no one would be creating these clones just on a lark. They'd be created for research—to be studied and experimented on. Wouldn't they need to give their consent?

"The ultimate goal of studying human evolution is to better understand the human race," Zorich writes. "But what if the thing we learned from cloning a Neanderthal is that our curiosity is greater than our compassion?"

SCIENCE & TECHNOLOGY

In With the New

THE SOURCE: "The New Normal" by Emma Marris, in ***Conservation***, April–June 2010.

Conservationists have traditionally focused their efforts on preserving "pristine" ecosystems—those unchanged by modern man—but an upstart brigade of ecologists is calling on the scientific establishment to pay more attention to what they call "novel ecosystems," writes Emma Marris, a writer working on a book about proactive conservation approaches. These are areas not under human management where species that have not previously existed together (and therefore did not evolve together) are now living in the same place. By one estimate, such ecosystems cover 35 percent of the earth, a proportion that is likely to grow.

Ariel Lugo, a scientist in Puerto Rico, has shown that novel ecosystems can be nearly as rich in species as native ones. They may also have more above-ground biomass and use nutrients more efficiently. Sometimes such ecosystems provide much-needed habitats for native species.

Peter Kareiva, chief scientist of The Nature Conservancy, says that studying novel ecosystems helps conservationists to "face the facts and be strategic" rather than try to deny their existence. In some cases, a novel ecosystem may be "better" at what are known as "ecosystem services"—processes that benefit humanity such as filtering water in wetlands, preventing erosion, and sucking carbon dioxide from the atmosphere. Should such ecosystems merit the same protection as pristine ones, or even more? That's "a question we don't talk about that much," Kareiva admits.

But novel ecosystems have their skeptics. James Gibbs, an ecologist at the State University of New York, Syracuse, warns that increased biodiversity is not inherently a good