

BOOKS & ARTS

Freezes, floes and the future

The story of Earth's glaciers and ice caps is key to understanding climate science, but this kaleidoscopic account lacks a strong narrative, argues **Johannes Oerlemans**.

A World Without Ice

by Henry Pollack

Avery: 2009. 304 pp. \$26

A World Without Ice opens with a strong foreword from Al Gore: the science has been done — now we must act. Eminent scholars such as geophysicist Henry Pollack, says Gore, are needed to communicate the severity of the climate-change problem to the public. But for several reasons Pollack's patchwork assessment of the science of ice and climate, doesn't quite meet that challenge.

His book gets off to a bad start by adding drama. Writing in his preface that "Throughout most of Earth's history, ice has been an indomitable force of nature", Pollack sidesteps the consensus view that for the majority of Earth's past there was little or no ice, even though signatures of glacial action are visible in many places today. He also overstates the contribution of the polar ice caps to the planet's albedo — the amount of sunlight reflected from Earth's surface — saying that the ice caps account for much of it. Climate models show that their contribution is less than 1% now, and was only 3% during the Last Glacial Maximum 18,000 years ago, when the land-ice area was three times that of today. Similarly, he cites mountain glaciers as the direct source of water for almost a quarter of the world's population, when in reality the bulk comes from rain and seasonal snow.

The book's mix of history and scientific fact makes for an informative but unfocused account. Pollack gives an entertaining overview of polar exploration, recalling famous expeditions and how polar science became



Melting Antarctic ice may be a good barometer of climate change but it is no crystal ball.

increasingly organized following the stimulus of the 1957–58 International Geophysical Year. He describes the ratification of the Antarctic Treaty by 12 nations in 1961, which declared Antarctica to be a peaceful, non-militarized continent open to scientific investigation and cooperation, and discusses the problems of polar tourism. Pollack explains how ice sheets work, how past climate can be deduced from deep-sea sediments and how changes in Earth's orbit have affected climate by redistributing incoming solar radiation. After describing the melting of the big ice sheets after the Last Glacial Maximum and the evolution of climate during the Holocene epoch, which started around 12,000 years ago, he jumps to the workings of the Intergovernmental Panel on Climate Change. This short but balanced section deserved a more distinct place in the book.

Pollack goes on to compare natural versus anthropogenic mechanisms of climate change, looking at solar activity, volcanism and greenhouse gases such as carbon dioxide. He describes how the human imprints of deforestation, industrial revolution, mining, erosion, irrigation and energy consumption have accreted at an increasing pace, bringing us into the 'Anthropocene' era of man-made environmental change.

In his investigation of the regional effects of global warming on ice, snow

and permafrost, Pollack adopts a fearful tone, suggesting that any change in the environment should be interpreted as a local disaster. He lists the many locations where glaciers are retreating, sea-ice coverage is shrinking, permafrost thawing and ski areas declining. And he cautions that "in only a few decades the Arctic Ocean may be ice-free in the summer, for the first time in 55 million years". Yet he forgets that, during the Holocene climatic optimum about 9,000 to 6,000 years ago when summer temperatures in the subarctic regions were 2–5°C higher than today, the Arctic Ocean in summer was probably ice-free on a regular basis.

Pollack's main message lies in the chapter 'Choices Amid Change'. He places global warming in the context of other environmental problems related to the luxurious lifestyles sought by more and more people. He makes a strong case for relatively simple measures that can reduce energy consumption: more efficient cars, smaller distances between home and work, investing in public transport and insulating buildings. I agree. Big solutions can take forever to become reality, whereas many small steps can make a difference.

It is not until the final chapter that he begins a welcome discussion on the uncertainties, merits and problems of large computer models of the climate system, stating that we must live with change and surprises. Again, his discussion of the ice sheets and sea-level rise is too dramatic: for example, it has not been established that



An ice core reveals historical and ongoing processes.

the Greenland ice sheet will melt away in a few centuries once we pass the 'tipping point'. I also missed a more thorough discussion of what would happen to sea levels and all of Earth's ice, known collectively as the cryosphere, if there were no anthropogenic influences on climate.

The slow, ongoing processes in ice sheets may be poorly understood, but they are likely to have implications for the future. For example, it is clear that the West Antarctic Ice Sheet is currently losing mass, but there is abundant evidence that the shrinkage has been happening for the past 15,000 years, mainly in response to rising sea levels initiated by

deglaciation in the Northern Hemisphere. Thus, limiting greenhouse warming may not lead to the desired stabilization of the ice sheet. We must then ask whether we want the cryosphere to remain as it is today, or for it to follow its own course with a minimum of anthropogenic influence. To answer this question we need to know the consequences. Fortunately, large amounts of ice-sheet data are now becoming available, particularly from the many different sensors on various space satellites. With clever modelling, in ten years' time we should be able to quantify the effect of slow ongoing processes on the future of the ice sheets.

A World Without Ice is kaleidoscopic: a collection of anecdotes, scientific lectures, travel reports, political statements and repeated arguments. In lacking a strong narrative it doesn't match my personal favourite in climate science, *Ice Ages: Solving the Mystery* (Enslow, 1979) by John Imbrie and Katherine Palmer Imbrie. But Pollack's entertaining book is worth reading, even if it does not offer the full story. ■

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Gail Wight, artist of science

Restless Dust

by Gail Wight

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The artist Gail Wight has examined X-rays with neuroscientists, pored over skeletal remains alongside archaeologists and thawed insects with animal behaviourists.

Wight, an associate professor in the Department of Art and Art History at Stanford University in California, likens her role in these short-term apprenticeships to that of a "lurker". The term is characteristic of her approach, in that it simultaneously diminishes her stature and emphasizes the tension inherent in the relationship. Some of these professional associations are internship-like shadowing sessions; others develop into something akin to collaboration. Each has led Wight to produce unique works of art that, over 20 years or so, have spanned media from photography and sculpture to film and performance art.

Among Wight's videos are colourful grids of the slime mould *Physarum polycephalum*, its growth visible using accelerated footage. Her *Ground Plane* large-format prints, depicting fossilized materials collected by Elizabeth Hadly's lab at Stanford University, include what might be termed 'mandible mandalas'. The massive, snowflake-like patterns are hand-constructed from photos of tiny fragments of animal bones, some of which are more than 10,000 years old.

Wight's sculptures include large-scale Plexiglas musical instruments that are 'played' by the mice captured inside them. If the captive mice bring to mind those that are probed and dissected in laboratories, the parallel isn't misguided. "I'm really interested in a critique of science, and one that scientists would appreciate,"

says Wight. "Scientists are the best [placed] to understand what's wrong with their field. I've been pretty delightfully surprised to find that they really love the critique aspect."

Another piece in which she aligns herself with the specimens of science, rather than with scientists, is one of her early performance works from 1992, *School of Evolution*. Its form took that of a day-long seminar, during which her audience was a fountain full of fish; she encouraged them to get on with evolution and thus escape their aquatic confines.

Humour is never far from Wight's artistic toolbox; nor, of late, has been the topic of evolution, through another collaboration — not with a living scientist but the ghost of one. For *Restless Dust*, an artist's book she completed this autumn during a residency in California at the San Francisco Center for the Book, Wight imagined taking Charles Darwin on a

tour of the San Francisco Bay area to record his impressions. A visit to a genetics lab makes him think about inbreeding — something that Darwin, who married his cousin, feared may have precipitated the premature deaths of three of their children.

Wight's book marks the occasion of the 150th anniversary of the publication of Darwin's *On the Origin of Species*, and the result is a leather-bound, letterpress-printed journal not unlike the one in which Darwin made the notes that eventually became *The Voyage of the Beagle*. These journals, which Wight produced in an edition of 50, are housed in small pine boxes — "little coffins", she jokes — that also contain life-sized, rice-paper models of a pair of mockingbirds, modelled on Darwin's own research material. The body cavity of each bird pulses with the dim light of a small, battery-powered bulb. The ghost may be Darwin's, but his specimens are memorialized too.

One of Wight's many scientist-collaborators is the animal behaviourist Lucia Jacobs at the University of California, Berkeley, who praises



Gail Wight explores the habits and history of scientific practice in this installation of pinned butterflies.