gravity. However, his idea was strongly contested in France by followers of philosopher René Descartes, whose theory of vortices in the ether had led them to the view that Earth must be prolate, like an upright egg. The geodesic mission thus settled a long scientific debate, and at the same time improved the accuracy of navigation by ships.

By 1735, the basic geometric and astronomical principles of trigonometric surveying were well understood. To the government and scientists in Paris, it seemed straightforward to apply these accurately among the peaks of the Andes, over a period of a year or two. But the expedition members had reckoned without a myriad of obstacles, large and small, including precarious mountain transport, extreme weather, earthquakes, altitude sickness, yellow fever, local love affairs and brigandry. They suffered the theft of their triangulation signals by local Indians, damage to instruments, the withdrawal of their French funding, Spanish colonial politics and the ripples from European wars, as well as the murder of their surgeon at a bullfight.

"The expedition had reckoned without obstacles including yellow fever, local love affairs and brigandry."

There were also purely scientific challenges, such as stellar aberration: the then little-understood phenomenon of tiny variations in the location of the stars used to fix latitude, which we now know arises as a result of Earth's motion around the Sun.

The most serious problem was the expedition's lack of leadership. Internecine squabbling nearly scuppered the project. The precious results announced to the French Academy in 1744 by expedition member and geophysicist Pierre Bouguer were those measured by himself and La Condamine, without the knowledge of the official expedition leader, Louis Godin, who decided to remain in South America as a professor of mathematics in Lima. *Measure of the Earth* accomplishes its mission with skill and devotion, although it lacks some necessary diagrams. Its intermixing of politics and science is particularly fascinating. It also shows, unintentionally, the astonishing development of international scientific cooperation since the days of the Enlightenment pioneers. ■

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ANTHROPOLOGY

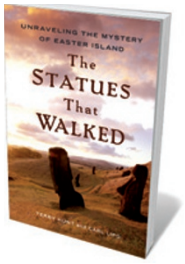
Head to head

A scenario blaming rats for the devastation of Easter Island doesn't account for recent results, argues **Paul Bahn**.

Easter Island, or Rapa Nui, is a perennial favourite of scholars and the media because of its numerous giant stone figures and supposed mysteries. Most of these enigmas — including the origins of the statues and the denuded landscape — have been solved in recent decades through painstaking work by archaeologists, anthropologists, environmentalists, linguists and geneticists.

A consensus view has emerged, summarized in *Easter Island, Earth Island* (Thames and Hudson; 1992) by botanist John Flenley and myself, that the island was deforested by its inhabitants. They cleared the land for crops and used timber for the transport and erection of ever more statues, with war the end result. In *The Statues That Walked*, archaeologists Terry Hunt and Carl Lipo present a different picture, portraying the islanders as environmentally sensitive and peace-loving until Europeans arrived in the eighteenth century. But some recent publications don't support their hypothesis.

Since the first known visit to the island by European vessels in 1722, people have wondered how so many huge stone statues could be transported and raised, given the lack of available timber. Discoveries of root moulds, pollen grains and stumps showed that the island was originally covered in millions of large palms and other tree species. Analyses of pollen and plant macrofossils revealed drastic deforestation between the thirteenth and seventeenth centuries, long before the Europeans arrived.



The Statues That Walked: Unraveling the Mystery of Easter Island
TERRY HUNT AND CARL LIPO
Free Press: 2011. 256 pp. $26

A wide range of evidence, along with oral traditions, suggest that the Easter Islanders had lived cooperatively for centuries after their arrival from Polynesia, probably in the early centuries AD. A thousand years later, they were in conflict, living in a barren landscape. The ecological decline of this small island serves as a warning of what is happening to Earth as a whole, as argued by Flenley and myself, and by geographer Jared Diamond in his best-seller *Collapse* (Viking, 2004).

Inevitably, this scenario has elicited doubts. Archaeologists Catherine and Michel Orliac have speculated that the island's deforestation was largely due to drought or climatic change, which may indeed have played a part. Others, including Hunt and Lipo, contend that the islanders' ills were caused by the arrival of Europeans, rather than internal social pressures.

In *The Statues That Walked*, Hunt and Lipo argue for a late date of around 1200 AD for the

PHOTOLIBRARY/CORBIS

Debate surrounds the transportation of Easter Island's statues and the disappearance of its forests.

islanders' appearance on Rapa Nui. They claim that deforestation was mainly caused by the rats that came with them. Having found some palm nuts bearing gnaw-marks, they attribute the extinction of the island's big palm to rat predation, although they say little about other tree species. The statues, they posit, were moved upright for many miles by swivelling, which required little timber. And despite the deforestation, they say, the islanders continued to grow sufficient food and remain free of quarrels until Europeans brought violence, germs and eventual devastation.

The authors' new scenario does support the consensus view that the island was only colonized once, by Polynesians — and not, contrary to the theory of Norwegian adventurer Thor Heyerdahl, by Amerindians from the New World. The book contains good passages on the carving and transportation of the statues — which we know from oral testimony to be ancestor figures that were venerated by the islanders — including an account of the pioneering excavations of the statue roads by US geologist Charlie Love. The practice of lithic mulching, in which millions of stones are spread over the soil to retain moisture for crops, is described in detail.

But coverage of work by others is incomplete. For instance, the authors mention only their own survey of the statues and not the decades-long (and ongoing) cataloguing by US archaeologist Jo Anne Van Tilburg. Nor do they note some recent published evidence that, in my view, refutes the book's basic tenets.

For example, a variety of evidence contradicts their claim of rat predation: numerous palm fruits not gnawed by rats, palm stumps burned and cut, continued germination of palms despite the rats' presence, and the disappearance of other plant species that coexist with rats elsewhere. Hunt and Lipo's claim that human skeletal remains show little evidence of lethal trauma is refuted by quotes from anthropologist Douglas Owsley, the author of a 1994 paper that they reference. After examining more than 600 Easter Island skeletons, Owsley stated in a 2003 BBC documentary that the extreme frequency of injuries proved that these were people at war: "They're slugging it out, there's no doubt about it."

Hunt and Lipo present some of the island's many features entertainingly, but the history of Rapa Nui is more complex than they allow. ■

Paul Bahn *is the author (with John Flenley) of* Easter Island, Earth Island. *An updated third edition is out this month.*
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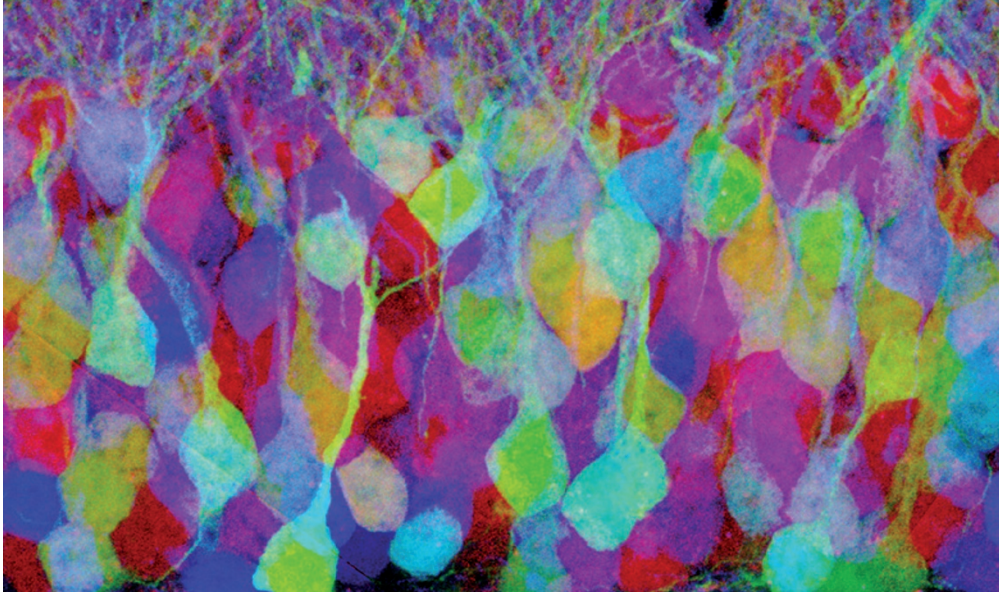

The Brainbow technique colours individual neurons, here in a slice of mouse hippocampus.

J. LICHTMAN/HARVARD UNIV.

NEUROSCIENCE

Picturing the soul

Alison Abbott revels in a stellar mix of brain imageries.

Generating beautiful images has never been the exclusive preserve of art: scientific representations of the brain have aesthetic value too, as portrayed in an exhibition at the German Hygiene Museum in Dresden, co-curated with the Moravian Gallery in Brno, Czech Republic. *Images of the Mind* presents more than 200 artistic and scientific works depicting the mind from medieval times to the present day. It also illustrates how the evolving imagery of artists has always been firmly rooted in contemporary scientific knowledge.

Star names among the artists exhibited include Rembrandt, Leonardo da Vinci, Lucas Cranach the Elder and Albrecht Dürer, as well as luminaries Caspar David Friedrich and Edvard Munch, and contemporary artists Bill Viola and Antony Gormley. Unusually, works by relatively unknown artists from central Europe are also on show: Bohumil Kubišta's 1911 *Epileptic Woman* is a masterly portrayal of emotional torment.

No less of a draw is the historical scientific imagery. Sketches by 1906 Nobel prize-winners Camillo Golgi and Santiago Ramón y Cajal are paired to illustrate a legendary scientific dispute. When they examined brain tissue under a microscope, each saw — and drew — a different structure. Golgi sketched a continuous web of cells; Cajal correctly depicted individual cells, or neurons.

Also on view are newly discovered drawings by neuroanatomist Korbinian Brodmann, who mapped the human cerebral cortex in 1908, and stunning images created using Jeff Lichtman's and Joshua Sanes's Brainbow technique. Developed at Harvard University in 2007, the method uses different colours to pick out individual neurons in a brain slice.

Images of the Mind
German Hygiene Museum, Dresden. Until 30 October.

The curators match the quality of the gathered objects with a fascinating narration of the history of mind imagery. The earliest exhibits are eleventh-century manuscripts depicting the Aristotelian understanding of cognitive processes. In the Renaissance, anatomists dissected corpses and drew, beautifully, what they saw, providing templates for artists to paint more realistically. Portraitists quickly attempted to go further, to capture the soul of their subjects as well as their external proportions. Rembrandt's series of tiny, detailed self-portraits in different emotional states encapsulates this perfectly.

Depictions of the mind changed again in the twentieth century, when Sigmund Freud divided the psyche into the conscious and unconscious. Artists such as Kubišta began to explore the fractured mind more abstractly — by then, photography was in any case capturing the realism to which they had formerly striven.

During the past few decades, scientists have described the brain in ever greater electrical, molecular and anatomical detail. Artists have responded, often questioning whether the wet, electrical mass of the physical brain could alone host the mind. Perhaps they are anticipating new neuroscientific understanding of the powerful ways in which environment shapes the brain. For both artists and scientists, the exhibition is a reminder that the mind remains a mysterious moving target. ■

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