to the emergence of anatomically and behaviourally modern humans. For most of the past four million years, several species of hominids coexisted, sometimes in limited geographical areas. The eventual peopling of the planet with a single, homogeneous species of hominid is shown to be exceptional on the geological timescale. The phenomenon is especially noticeable with the first hominids, the australopithecines, for which eight species are now listed in the indexes. In the fierce controversies over the origin and relationships of these pre-humans, Klein is an outsider, developing his own views in a moderate style without becoming trapped in the usual pitfalls of either ignoring or trying to ridicule contradictory arguments.

A first 'out of Africa' movement followed the rise of a new model of hominid some 1.8 million years ago. *Homo ergaster*, a genuine human, was a tall, sweaty hunter adapted to open landscapes. This first movement resulted in the colonization of most of the warm and temperate zones of the Old World. *Homo erectus* developed in the Far East and Neanderthals in Europe. Eventually, one species, *Homo sapiens*, expanded to replace or outnumber its predecessors. The mechanism of the emergence of modern humans has been one of the most hotly debated issues in palaeoanthropology. Genetic and palaeontological evidence seems to support the African origin of all living populations. Yet questions remain over the path to modern humankind. Did certain archaic populations participate genetically in the development of the same living groups? How many 'out of Africa' events really occurred? What were the environmental and behavioural conditions of modern human expansion?

According to Klein, an 'out of Africa 2' movement started 50,000 years ago, spreading modern anatomy and behaviour throughout the planet. After a long period of very slow technical evolution, innovation and versatility suddenly became the engines of a genuine cultural revolution, while symbolic thought started to express itself. However, anatomically modern humans are known to have existed 100,000 years ago and did not develop any of these behaviours. Klein has his own answer to this puzzle. He favours the view that a neurological change occurred, rather than that purely linguistic, sociological and technical developments precipitated the revolution. This theory is hardly testable on the fossil record, and is where Klein will probably find most of his critics.

If you could have only one book that deals with human evolution, this is definitely the one to choose. In any event, the author has skilfully included all the others in it. If you are an aficionado, you will not want to miss this reference book describing the state of the art in a rapidly evolving field. ■

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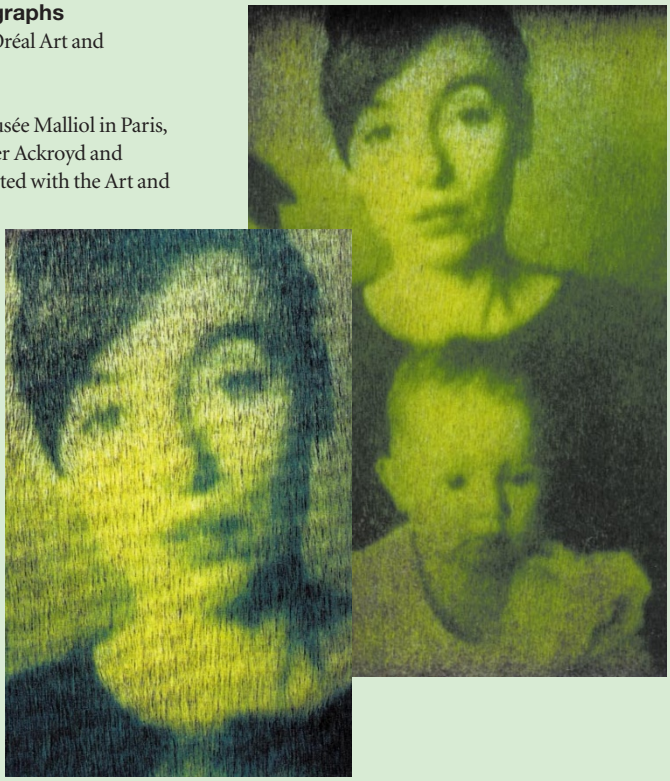
# Science in culture

## Photo-grass photographs

British artists win the L'Oréal Art and Science of Color Prize

*Martin Kemp*

On 25 January, at the Musée Malliol in Paris, the British artists Heather Ackroyd and Dan Harvey were presented with the Art and Science of Color Prize, awarded by the L'Oréal Art and Science Foundation. The prize was established in 1997 by the Tokyo-based foundation, the brainchild of Tetsuzo Kawamoto, for Japanese artists and scientists. It is intended to promote a creative dialogue between art, science and colour. This is its first international year, involving a multinational jury, including myself. The winners, Ackroyd and Harvey, use grass as a novel surface for producing photographic images.



**Ackroyd and Harvey's *Mother and child*, created by grass photosynthesis.**

Anyone who has seen the effect made by something lying on a grass lawn for a few days will have noticed the yellowish imprint when it is lifted away. The pale silhouette may be considered as a kind of photographic negative, fading from view when sunlight restores the yellowed grass to its former greenness. Using the photosensitive property of grass, Ackroyd and Harvey have collaborated with scientists at the Institute of Grassland and Environmental Research (IGER), at Aberystwyth in Wales, to perfect the production of fully legible, 'living' photographs on a germinating lawn.

Their positive photographic images are formed by the projection of a black-and-white negative onto the surface of the growing grass. Such is the sensitivity of each germinating blade of grass that it produces a chlorophyll concentration that corresponds directly to the quantity of light available to it. Leaves of varied colour, from a rich, dark green to a sickly pale yellow, combine to form tonal images of a subtly elusive kind. They strongly recall the soft beauty of the callotypes made by William Henry Fox-Talbot during the years immediately following the first announcement to the public of the rival French and British photographic processes in 1839.

The biological researchers with whom Ackroyd and Harvey worked at IGER during 1997–98, as a result of a Wellcome 'Sciart' award, are developing techniques for controlling the enzyme that degrades chlorophyll as a leaf dies. They have devised ways of modulating the expression of the gene responsible for the enzyme that causes the senescence of the green leaves. The scientists' newly engineered 'staygreens', which resist yellowing senescence, possess obvious potential for increasing the longevity of the artists' evanescent photographs. On their own behalf, Ackroyd and Harvey have placed particular demands on their unconventional medium in order to achieve minute gradations in green tonality. Their interests have been served by IGER's use of advanced visual analysis techniques, in particular the high-resolution imaging technique of hyperspectral analysis.

Ackroyd and Harvey's beguiling results, which revive the strange visual magic of early photographic images from more than 150 years ago, are underpinned by today's most advanced plant genetics and optical precision. Their grass-works testify to the ceaseless wonder of living nature in all its responsive subtlety, and to the more creative potential of human intervention in nature's supersensitive systems. Not least, it is a relief to find genetic engineering featuring in a story that does not involve scares — whether well- or ill-founded. ■

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