which was Dirac's point. Many of the most beautiful equations of mathematics originated in questions posed by science. But some beautiful equations didn't, and that ought to be said, too. Let's hope there is a sequel. ■

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A milestone for a new millennium

The Human Genome
edited by Carina Dennis & Richard Gallagher
Palgrave: 2001. 156 pp. £19.99, $30

Daniel Cohen

The sequencing of the human genome was the last major goal to be set by leaders of science in the twentieth century. Its achievement was certainly as spectacular a triumph as the launching of the first spacecraft or landing on the Moon. It was also an amazing example of cooperation and competition between scientists, government funding agencies, charities, and public and privately funded projects. In a symbolic way it is a manifestation of the dramatic cultural changes that humanity undergoes at the turn of a new millennium.

Nature was an active supporter of the project to sequence the human genome, promoting ideas, lobbying for more funds and publishing outstanding achievements, including a completed draft sequence. So it is natural to see two senior editors of *Nature* compiling a book on this epochal achievement. The book is aimed at both non-specialists and students in the field, and presents the goals, history and consequences of obtaining the genome sequence. With a foreword by James Watson, the book describes early achievements in DNA structure and human genome mapping, followed by a detailed account of the dramatic course of events that led to the sequencing the human genome ahead of schedule.

The style is very clear and the authors present not only the facts, but also the spirit of this dramatic race. Although it is probably too early for a full understanding, the authors have tried to assess the future impact of human genome sequencing on biology, medicine and society. The book contains very good illustrations and historical photographs of key participants of the project. The original article reporting the sequence obtained by the public consortium, with schematic gene maps and accompanying papers, makes up more than half of the book. It will be a pleasure for any scientist to have this milestone book in their personal library. ■

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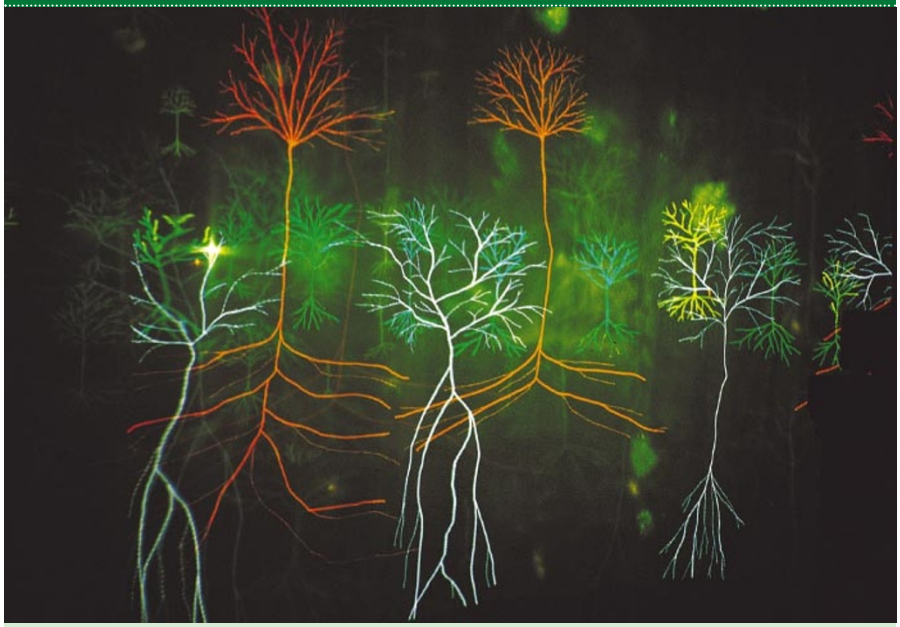
Science in culture



Knowing neurons
A dynamic installation highlighting the fluidity of brain function
Martin Kemp

"*The work is a homage to the beauty and sheer complexity of the structure and its steady development, its genetically-driven growth influenced by experience.*"

"*The complexity and beauty of its structure… reflects the developmental constraints that shaped its growth.*"

These two quotes are from writers extolling the wonder of the neuron, as disclosed by modern neurobiology. The first is from Andrew Carnie, one of the 'researching artists' featured in the exhibition "Head On. Art with the Brain in Mind" at the Science Museum in London (on view until 28 July 2002). The second is from Richard Wingate of the Medical Research Centre for Developmental Neurobiology, King's College London, in whose laboratory Carnie was introduced first-hand to "the distributed circuitry whose logic remains one of the greatest mysteries of biology" (Wingate again).

Their shared experience was the result of one of eight such collaborations set up by the curators of the exhibition — Caterina Albano, Ken Arnold and Marina Wallace — under the aegis of the Wellcome Trust. The other artists are Osi Audu, Annie Cattrel, Catherine Dowson, Letizia Galli, Claude Heath, Gerhard Lang and Tim O'Riley.

In building up his three-dimensional visualization of the brain, Carnie looked back to the pioneering work of Santiago Ramon y Cajal. Cajal used thin slices of tissue, impregnated with resin and stained by a method invented by Camillo Golgi, to construct an imaginative spatial picture of the cellular structure within the brain. Using Golgi stains, Cajal was able to infer the composition of different brain regions and even to suggest the direction of information flow. Cajal and Golgi were awarded Nobel prizes in 1906.

The modern resources available to Carnie, such as laser-scanning confocal microscopes and MRI scans, can be used to create compelling spatial arrays and to transcend the static pictures of morbid anatomy, capturing the three-dimensional dynamism of the living circuitry. Carnie was drawn into the amazing worlds of the proliferation, migration and connectivity of neurons in the developing mind, particularly as drifting memories are laid down.

What Carnie set out to capture in his installation, *Magic Forest* (above), was not an illustration of brain physiology but an evocation of the fluid flux that is the essence of neuronal transformation, as the growing cells extend their branches to communicate with companions near and far. Two projectors stand three metres apart on plinths at either end of a darkened space. They alternately project 160 slides on to three large gauze screens. As the images dissolve into one another, the forest grows and diminishes, comes and goes, builds and collapses, layer by layer, in an endless loop of generation and decay.

At these cutting edges of creative visualization, the tasks of the artist and the scientist both begin at the boundaries where knowledge runs thin. The artist gives vent to his awe through the magic of visual suggestion; the scientist through an insatiable urge to explain 'how'.

"It has been a breathtaking experience." The words are Carnie's, but they could have been said by any scientist grappling with what Wingate calls the "slices, fragments and snapshots" that "remain, for the time being, the basis of our understanding of neuroanatomy".

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