

## Neuroscience

## Genomics on the brain

The 1990s may have been designated the 'Decade of the Brain', but they will also be remembered as the time when genomics came to the fore. This year, neuroscience and genomics teamed up in projects that promise to propel the study of the brain into the realm of 'big science'.

Working on Parkinson's disease? One of the projects that surfaced this year might provide you with a transgenic mouse that offers fluorescent neurons in key neural pathways. Another could offer you structural brain images along with DNA samples from patients. Still stuck for inspiration? Another project will map all of the active genes in the neural pathways of your choice.

One of the most exciting initiatives owes its existence to the world's fourth-richest man, Paul Allen, who co-founded the software giant Microsoft. In September, he announced the donation of US\$100 million over five years to create the Allen Institute of Brain Science in Seattle, Washington. Its first endeavour will be to produce a comprehensive atlas of gene activity in the mouse brain.

This will be a huge task — two-thirds of the 30,000-or-so genes in the mouse are expressed in its brain. Indeed, the project

could generate petabytes of data — the same order of magnitude as all of the information currently held on the Internet. No wonder, then, that the Allen Institute has hired Mark Boguski, one of the world's foremost bioinformaticians, as its founding director.

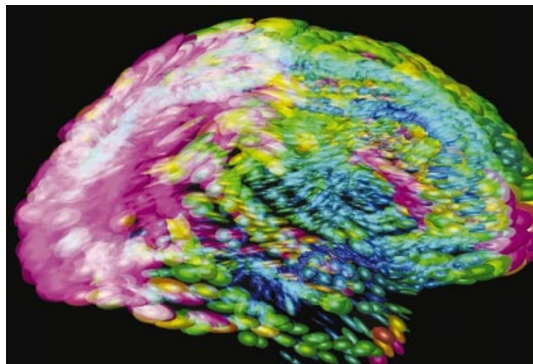
The Allen Brain Atlas picks up from another project with similar goals: the Brain Molecular Anatomy Project (BMAP), launched by the US National Institutes of Health in 1998. "It was too early," says Boguski. "Back then we didn't even know how many genes there were." And whereas BMAP would have taken decades to finish the task, Boguski and his colleagues are refining high-throughput methods that should allow them to complete their atlas by 2006.

The Allen Institute's initiative will show you where all of the genes in the mouse brain are expressed, but if you're interested in gene activity in individual brain cells, your favourite project is likely to be GENSAT — the Gene Expression Nervous System Atlas.

GENSAT's scientists, led by Nat Heintz of Rockefeller University in New York, place each gene under investigation into a bacterial artificial chromosome (BAC), along with a genetic element that stitches a fluorescent tag onto the protein encoded by the gene. By

creating transgenic mice that carry these BACs, the researchers can identify — by sight — the cells in which a gene of interest is normally active, and can work out how these cells connect with the rest of the brain. The same BACs can also be used to introduce other genetic modifications into these cells, providing a unique tool to investigate their biology.

GENSAT's first images can already be seen on its website, which was launched in October alongside a paper introducing the project (S. Gong *et al. Nature* **425**, 917–925; 2003). GENSAT scientists aim to study some 300 genes each year, through funding from the National Institute of Neurological Disorders



All in the mind: a composite image of 20 healthy brains highlighting areas of variation (pink) between the subjects.

and Stroke in Bethesda, Maryland.

This year also saw the launch of the German-led Human Brain Proteome Project, which will catalogue all of the proteins found in the brain. And in the summer, the International Consortium for Brain Mapping, which since 1993 has been compiling a database of structural images of human brains — covering both healthy individuals and patients with neurological or psychiatric disorders — launched itself as a neuroscience resource. Most of the subjects represented in the database have also provided blood samples, which is a boon for researchers who want to investigate the association between particular genetic profiles and unusual brain structures seen in various diseases.

Now that these projects — and related initiatives focusing on particular brain processes or regions — are up and running, perhaps it's time to commission a sequel to the Decade of the Brain. ■

**Alison Abbott**

Allen Brain Atlas ▶ [www.brainatlas.org](http://www.brainatlas.org)

BMAP ▶ [trans.nih.gov/bmap](http://trans.nih.gov/bmap)

GENSAT ▶ [www.gensat.org](http://www.gensat.org)

Human Brain Proteome Project ▶ [www.hbpp.org](http://www.hbpp.org)

International Consortium for Brain Mapping

▶ [www.loni.ucla.edu/ICBM](http://www.loni.ucla.edu/ICBM)

## GOODBYE

## Edward Teller

On 9 September, the father of the hydrogen bomb passed away. He was a controversial figure, who was vilified by many physicists after testifying in 1954 that Robert Oppenheimer, leader of the wartime Manhattan Project, was a security risk. Teller later championed President Ronald Reagan's 'Star Wars' missile-defence initiative. But colleagues at the Lawrence Livermore National Laboratory, co-founded by Teller, say that he should also be remembered for his passion for teaching physics.

## Galileo

One of NASA's most successful planetary probes took a suicide dive into Jupiter on 21 September. Having nearly run out of fuel, Galileo was aimed straight at the planet to prevent it from accidentally crash-landing on Europa, one of Jupiter's moons, which some suspect may harbour extraterrestrial life. The craft tore apart as it descended into the gassy planet's atmosphere; its last data transmission arrived on Earth 52 minutes later.

## Dolly the sheep

At the relatively tender age of six, Dolly died. After falling ill of a progressive lung disease, the first mammal to be cloned from an adult cell was put down for welfare reasons. Dolly also suffered from arthritis, but it is unclear whether her ailments were a side effect of her unusual genesis. Dolly the icon lives on, stuffed, at the Royal Museum in Edinburgh.

## Japan's satellites

Mission controllers were forced to say 'adios' to Japan's Midori-II Earth observing satellite, also known as ADEOS-II, in October, just ten months into a three-year mission. Its electronics are thought to have been blasted by solar flares. The following month, a Japanese rocket carrying two spy satellites was forced to self-destruct ten minutes after launch when its boosters failed to separate. And Nozomi, Japan's first planetary mission, ran out of fuel in December and officially missed its target of Mars — completing a miserable year for the nation's space programme.

## And if we're not careful...

Atlantic cod were officially declared endangered by Canada, and stocks have also crashed in the North Sea — where warming waters are reducing larval survival, adding to the effects of overfishing. Cod are not alone. The number of chimpanzees and gorillas in West Africa has plunged by about half over the past 20 years, researchers revealed this year. If current trends continue, hunting, habitat destruction and Ebola fever will drive them to the brink of extinction within a decade. More than 12,000 species of plants and animals face a similarly bleak future, according to the World Conservation Union.