IN THE NEWS

Venter — the catalyst
Craig Venter needs no introduction, and if you thought that now that he has given up the presidency of Celera Genomics his name would disappear from the newspaper headlines, then think again. For Venter, who described himself in *The New York Times* (US) as "a superenzyme […] catalyzing things", has now "announced that the DNA his company used was largely his own" (*New Scientist*).

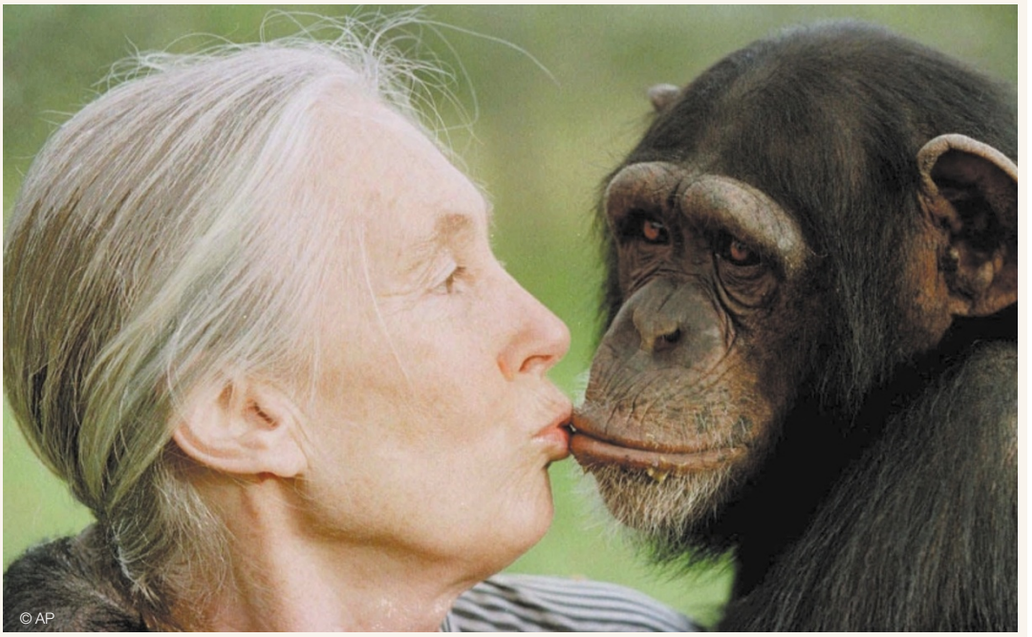
At the time, Celera claimed that the DNA they used for sequencing came from a pool of 21 anonymous donors. It seems however that Venter "had overridden the process when he was the head of the company, with the result that its genome was mostly based on his DNA" (*Observer*, UK). Interestingly, analysis of his own data revealed that Venter carries "a gene [ApoE4] variant associated with abnormal fat metabolism and an increased risk of Alzheimer's" (*New Scientist*) — he claims that he is already taking fat-lowering drugs to counteract its potential effect.

The Celera scientific advisory board were not impressed by his revelation — "[a]ny genome intended to be a landmark should be kept anonymous. It should be a map of all of us" (*New Scientist*).

Not content with having his DNA sequenced, Venter now intends to devote a whole book to it. He told *The New York Times* that he "will do a detailed examination of [his] genetic code and use that as a basis of writing [his] book on genomics".

He also announced that he plans to set up two new institutes, one of which "will study issues of science policy like the genetic basis of race and stem cells", whereas the other will work towards genetically engineering bacteria "to convert carbon dioxide into hydrogen, producing clean energy and averting greenhouse warming" (*The New York Times*).

Magdalena Skipper



EVOLUTION

Expressing our humanity

The question of what it is that makes us human has occupied the minds of philosophers for centuries. Now, biologists are pondering this question too. What could underlie the many behavioural, cognitive and morphological differences between us and our closest relative, the chimpanzee, when we share 98.7% of our DNA with them? In a unique investigation of gene-expression levels in humans and primates, Svante Pääbo and colleagues now report that rapid evolutionary changes in gene-expression levels in our brains might underlie what distinguishes us from other primates.

From the results of two gene-expression studies, Enard *et al.* found evidence that the human brain has undergone more changes in gene expression during recent human evolution than have other human or primate tissues. In their first experiment, the authors assayed mRNA levels in the livers and brains of three humans, three chimpanzees and an orang-utan on an oligonucleotide array representing ~12,000 human genes. In the second experiment — carried out to ensure that the first set of results had not been biased by the use of a human oligonucleotide array — the authors used a membrane-based array carrying ~21,500 human cDNA sequences to which they hybridized new mRNA samples prepared from the brain, blood and liver of humans, chimpanzees and macaques.

Both studies showed that within-species variation is substantial compared with that between humans and chimpanzees, but that gene-expression patterns exist that distinguish the two species from each other. Data from the second study showed that expression patterns in human blood and liver most closely resembled those of the chimpanzees, and not the macaques, as might be expected from the evolutionary relationships of these species. Suprisingly, however, when gene-expression profiles from chimpanzee brains were analysed, they most closely resembled brain gene-expression patterns in macaques and not in humans. Moreover, in both studies, genes in the human brain showed an accelerated rate of change in their expression levels, as compared with the other primates studied. No such accelerated rate of change was seen in human liver or blood.

It seems that these unusual expression patterns are primate specific. When the authors compared gene-expression patterns between three species of mouse — *Mus spretus*, *M. caroli* and *M. musculus*, which were chosen because *M. spretus* and *M. caroli* have diverged from *M. musculus* to a similar extent as chimpanzees and orang-utans have from humans — they found similar rates of gene-expression change in their brains and livers.

Finally, the authors used two-dimensional gel electrophoresis to study the protein content of chimpanzee and human brain samples. As a control, they compared protein patterns from the same brain region of *M. spretus* and *M. musculus* mice. This study identified many differences in the proteomes of human and chimpanzee brain tissue, and highlighted that quantitative differences between these two species are much more common than they are between the two mouse species, strongly indicating that gene-expression differences between humans and chimpanzees translate into quantitative differences in their proteomes.

Using tandem mass spectrometry, the authors have now begun to identify the protein spots that show the greatest variation between humans and chimpanzees. One of their many future challenges will be to explain how these reported differences in our brain's transcriptome and proteome have functional consequences that set us apart from other primates.

Jane Alfred

References and links

ORIGINAL RESEARCH PAPER Enard, W. *et al.* Intra- and interspecific variation in primate gene expression patterns. *Science* **296**, 340–343 (2002)

WEB SITE
Svante Pääbo's lab: http://www.eva.mpg.de/genetics