

The Dr H.P. Heineken Prize for Biochemistry and Biophysics 2006

The work of Professor Sir Alec J. Jeffreys presented by Professor Rob Kaptein, Chairperson of the Jury of the Dr H.P. Heineken Prize for Biochemistry and Biophysics

Prize citation: for 'his discovery of the genetic fingerprint'.

Professor Jeffreys,

We human beings differ because the DNA in our genes differs. This would now be obvious from a comparison of human genome sequences, but in the mid-eighties, long before the human genome had been sequenced, Alec Jeffreys discovered that our DNA contains regions that are unique to each individual. He also invented a method of identifying these regions, which became known as 'DNA fingerprinting'. Within a few months of its discovery, this method was already being put to practical use in a paternity test to settle an immigration dispute.

Because a DNA fingerprint can be obtained from miniscule amounts of DNA in blood stains, hair or bone, it was also quickly put to use in criminology and today forms the basis of forensic science. We are all familiar with these methods from popular television series such as *CSI* (Crime Scene Investigations). It is for the discovery of the genetic fingerprint that Professor Alec Jeffreys has been awarded the 2006 Dr H.P. Heineken Prize for Biochemistry and Biophysics.

It is interesting to note that there is a Dutch connection underlying his discovery. After Professor Jeffreys obtained his Ph.D in 1975 from Oxford University, he worked for two years as a post-doctoral fellow at the University of Amsterdam in Piet Borst's laboratory. As many of you know, Piet Borst was awarded the Heineken Prize in 1992. Working with Richard Flavell, Alec Jeffreys developed a method of analysing individual genes, based on the Southern blot technique. This led to a very important finding: they showed for the first time that eukaryotic DNA contains non-coding regions within genes (known as 'introns'). Introns had been shown to exist in adenovirus before, but they also turned out to be a universal property of eukaryotic genes. Later, after Alec Jeffreys took a position at the University of Leicester in 1977, he used the same method to analyse the myoglobin gene and discovered 'minisatellite regions', consisting of tandem repeat DNA sequences in the intron of this gene. Here, short DNA sequences repeat themselves many times over; it is as if the DNA starts stuttering in these regions.

The minisatellite was the key. It led to the discovery of other, similar regions that are characteristic for each individual. In 1984, all this resulted in the discovery of the genetic fingerprint.

It is astonishing to see how far-reaching the consequences of this discovery have been for society and how rapidly practical use has been made of it. DNA fingerprints can now be used whenever individuals have to be identified or family relationships established. I already mentioned parenthood testing and criminology. Other examples are in archaeology (are these the bones of the last Russian czar?) or in the detection of pathogenic genes in congenital diseases. There are also applications that address important questions in animal breeding and ecology. For instance, the technique has recently been used for assessing the number of remaining Panda's in a Chinese resort that are at the verge of extinction. It is a clear reminder to our politicians that real innovation comes from basic research!

In his current research, Professor Jeffreys is interested in genome instability and how changes occur in DNA by mutations. For instance, he has investigated how irradiation from the Chernobyl disaster in 1986 has caused genetic mutations. Again, the minisatellite regions play a key role in this work.

Even now, Alec Jeffreys is a 'hands on' scientist who likes to work in the lab and evidently finds time to do so. In him, the Academy is honouring an outstanding scientist who has made fundamental discoveries concerning the structure and organisation of DNA and stimulated a wide range of DNA technologies to address important societal problems.

Professor Jeffreys, on behalf of the jury I would like to congratulate you on your Dr H.P. Heineken Prize for Biochemistry and Biophysics, which I hope will be a major incentive for your current and future scientific research.