Your genetic material holds the key to the colour of your eyes, or whether you have a long nose. But it also contains information that might surprise you, as the islanders on Tristan da Cunha have found.

Scientists have long known that special DNA markers found in a man's Y chromosome hold clues to the identity of his male ancestors.

The remote island of Tristan da Cunha, with its well-documented history and very isolated population, provided ideal conditions for scientists to use DNA technology to test the accuracy of the island's genealogical records.

Tristan da Cunha was first settled in 1816, and the current population (of just over 300) is thought to have descended from only seven males, all from western Europe or the USA. There are also only seven family names in use, one for each of the founding fathers.

A group of researchers, led by Prof Himla Soodyall, research director of the MRC/ WITS/ NHLS Human Genomic Diversity and Disease Research Unit, studied the Y-chromosome DNA of more than seventy male inhabitants of Tristan da Cunha.

The researchers extracted DNA from blood samples collected on the island in 1982, and tried to match what they saw to the historical records on the island.

Y-chromosomes can only be passed from father to son, in the same way as traditional family surnames. They are distinguished from each other by specific genetic markers, called haplotypes. Haplotypes are like barcodes that can tell geneticists from whom you inherited your genes - or, perhaps more significantly, from whom you did not.

Within a small population group such as that on Tristan da Cunha, it was reasonable to expect that each surname would relate to one specific Y-chromosome haplotype. In order to protect the sensitivities of the islanders, each family name was assigned a number between one and seven.

For the most part, the findings of Prof Soodyall and her team corresponded with the island's records. They found seven haplotypes that corresponded to each of the seven founding fathers - one for each of the family names in use.

However, there was one other: a haplotype that is usually found only in males hailing from eastern Europe.

Prof Soodyall and her team deduced from the genealogical records that the introduction of the mystery DNA took place in the early 1900s. As chance would have it, it has been well documented that ships, some from Russia and Norway, used the island as a stop-over port during this time.

"This finding provides evidence for the contribution of a hidden ancestor who left his genes - but not his name - on the island," the team wrote in their report for the European Journal of Human Genetics.

But the story doesn't end there: the team found additional instances of non-paternity in the group of men they studied: the haplotype associated with family 5 appears in males from two of the other families (numbers 6 and 7), and the haplotype of family 7 was found in two different branches of family 5.

There are two possible explanations for this. Firstly, the introduced Y-chromosomes could be the result of pre- or extramarital affairs involving men from the island community. The second explanation is that the chromosomes were left on the island by other hidden ancestors who happened to have haplotypes that were identical to those already found on the island. It is difficult to determine the mathematical probability of an internal, rather than an external, source for these chromosomes in the Tristan da Cunha population. However, given the presence of the two lineages on the island already, as well as the remote location, it seems improbable that these chromosomes were introduced by mysterious visitors.

So far, the quest to trace ancestors and distant relatives has mainly relied on oral traditions, church records and other documents. As this study showed, DNA can often give a more accurate picture. "The human genome is an archive of our history and evolutionary past," says Prof Soodyall.

Y chromosomes, haplotypes and inheritance

Human DNA is consists of around three billion "letters", or nucleotides. These "letters"

form a code that contains all the instructions needed to build a unique human being.

Our DNA can be divided into 23 pairs of chromosomes, which become visible during the process of cell division. The first 22 chromosome pairs consist of one chromosome from our mothers and one chromosome from our fathers, giving us two copies of each chromosome. These copies are very similar, but never exactly the same - they are the source of our individuality.

The last chromosome pair is special: it is what distinguishes men from women on a DNA level.

Women have two X chromosomes (XX), and men have one X and one Y chromosome (XY). When a male child is conceived, he can inherit his Y chromosome only from his father, which means he only has one copy of that chromosome. A female child will have two copies of the X chromosome, one each from her mother and father.

In human populations, most genetic variations occur when just a single letter of our DNA code changes (also known as a single-nucleotide polymorphism, or SNP) and that change is inherited by the following generations.

Over the course of human evolution, many of the SNPs have occurred. Interestingly, we normally don't inherit just one of these SNPs at a time - groups of them band together and are passed on as a single unit called a haplotype.

Some haplotypes, especially those found on the Y chromosomes of males, escape the process of recombination or reshuffling that normally takes place during sexual reproduction. They hardly change at all from generation to genera-tion, which makes them ideal for tracing patterns of inheritance in a population.

Because men inherit the Y chromo-some from their fathers only, studying the haplotypes of the Y chromosome gives researchers a clear picture of who the direct male ancestors of a male individual are.

For more information, contact **Prof Soodyall** by email: xsood@global.co.za.
You can read more about Tristan da Cunha on http://www.sthelena.se/tristan/index.htm.

PO Box 19070, 7505 Tygerberg, South Africa
HO Tel +27 (0)21 9380911 / Fax +27 (0)21 9380200