

The hand you're dealt

This trait can be either a blessing or a burden. On the plus side, it may confer mathematical or literary talent. Less attractively, it is loosely associated with autism, dyslexia, speech disorders and, in some cultures, later marriage and fewer children. The trait may even expose one to a higher risk of accidents.

The trait is left-handedness, exhibited by about 12 per cent of the British population. The national distinction is significant — Eastern nations have lower rates of left-handedness, with only one in 25 Japanese going against the right-handed grain. It is more common among males than females (there are five left-handed men for every four left-handed women), slightly more common among homosexual men than heterosexual men, and it is a uniquely human characteristic (no other animal species convincingly demonstrates handedness, footedness or pawedness).

The origins of handedness remain an enigma, although scientists are beginning to piece together the fascinating story of how it may have arisen. One of the best-known laterality sleuths is Chris McManus, professor of psychology and medical education at University College London, who has

The proportion of left-handers in Britain has risen fourfold in a century. Anjana Ahuja explains a new theory of their genetic history

written *Right Hand, Left Hand*, a scientific and cultural account of some of life's quirkier asymmetries. His genetic model of handedness can explain, among other things, why the proportion of left-handers in Britain has increased over the past century.

He is the brains behind the theory of how we came to favour one hand over the other, despite such favouritism being absent in our closest animal relatives. "The only two things we seriously know are that chimps have a 50-50 split in handedness, which is due to chance, yet 90 per cent of human beings are right-

handed," McManus says. "We have somehow gone from one to the other, and we need to tell the story."

Somewhere along our evolutionary history, he believes, we departed from chimps and other apes to develop a gene for right-handedness (he called it D, for dextral). This was allied to the development of language, which happened in only one half of the brain — the left hemisphere. McManus, who is right-handed but whose mother was left-handed, explains: "It would not have worked to put language in both hemispheres, because the corpus callosum (the bundle of nerve fibres connecting the two halves) is relatively slow and inefficient. The connections within each hemisphere are fast and reliable, which is essential for language."

"Crucially, the left hemisphere controls the right-hand side of the body, so the right hand became more dextrous at tasks such as hammering stone tools." Indeed, stone tools discovered two million years ago show that our forebears then were exclusively right-handed. If handedness accompanied language, he adds, then we would not expect any other animal species, bereft of language, to develop handedness.

Then, McManus says, between two million and 5,000 years ago a second gene arose (called C, for chance), which allowed left-handedness to emerge. The second date is bounded by the fact that artworks over the past five millennia that depict people engaged in skilled activities, such as writing or throwing a weapon, display roughly the 90-10 percentage split in handedness that we see today.

What happened to make some of our forebears left-handed, after millions of years of right-handedness? The primary role of this second gene, McManus says, was to tweak brain structure so that the left hemisphere could accommodate other faculties apart from language. This tweaking — caused by inheriting one C gene and one D gene (one from each parent) — would furnish a person with, possibly, a better brain. This gene combination also happened to shift hand dominance in a minority of individuals from the right to the left.

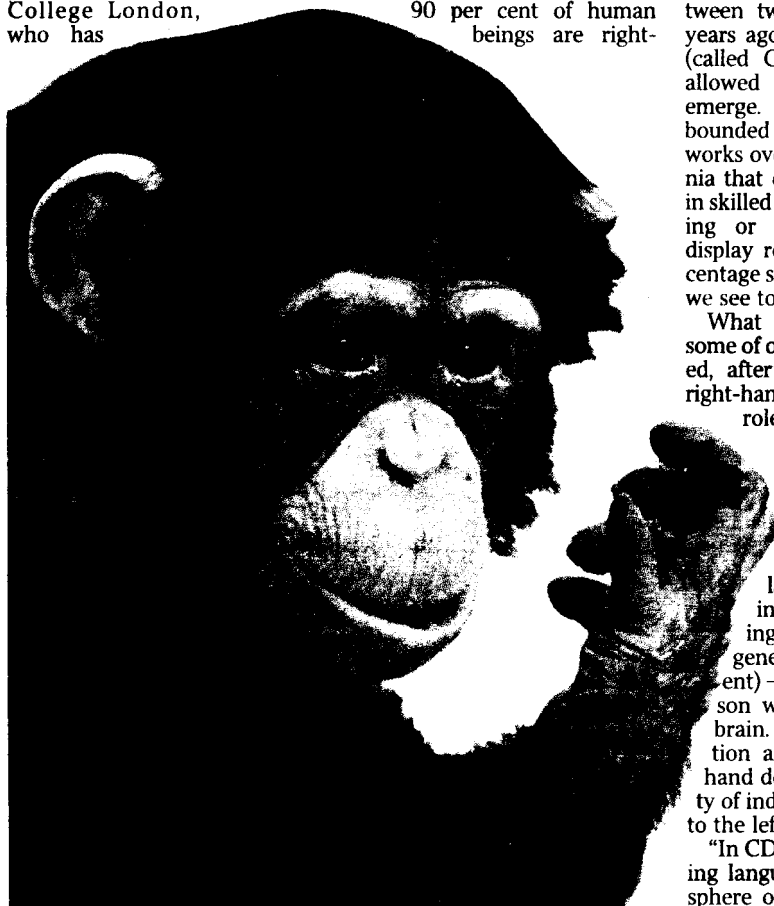
"In CD brains, instead of having language in the left hemisphere only and non-language

things in some of the other side that right-hand built in a think mal geous.

"Imagir having sp the left this mear and langi to each c particular doing n Although sure, the of left-han maticians as high cent; ther enough e left-hand cal talent

Howev crossover spheres — itance — piggledy McManu: nation m why au speech di: ing are o left-hand: ditions ar mon amo

Interes children: have gen — show handedne populatio that this n cal origin me if the: genes lur: some whi



scan

pot dar macl a only cen

pl

PA; IMAGEBANK

Only 10 per cent of human beings are left-handed but half of chimps are

t

things in the right hemisphere, some of those faculties flip over to the other side," McManus says. "You get things side by side that you wouldn't find in a right-handed brain; they are built in a different way which I think makes them advantageous.

"Imagine, for example, having spatial faculties in the left hemisphere — this means that symbols and language are next to each other. This is particularly good for doing mathematics. Although we are not sure, the proportion of left-handed mathematicians could be as high as 20 per cent; there is certainly enough evidence to believe that left-handedness and mathematical talent may be linked."

However, having too much crossover between brain hemispheres — caused by a CC inheritance — may lead to "higgledy-piggledy brains", according to McManus. This genetic combination may lie at the heart of why autism, dyslexia and speech disorders such as stuttering are overrepresented in the left-handed population (the conditions are also much more common among boys).

Interestingly, gay men — and children as young as seven who have gender-identity problems — show higher rates of left-handedness than the general population. McManus suspects that this may also have a biological origin: "It wouldn't surprise me if there was another pair of genes lurking on the X chromosome which was modifying the

normal handedness genes. That may explain the male excess in autism, stuttering and dyslexia, and may also explain some of the things going on with homosexuality."

Whether handedness really is down to combinations of C and D genes remains educated guesswork on McManus's part, since the location and sequence of any handedness genes remain a mystery. However, the number and distribution of left-handers in families fits his genetic model convincingly. The introduction of chance into handedness can explain why one identical twin can be left-handed and the other right-handed (McManus's own identical twin daughters, Franziska and Anna, show this split); why

identical twins are more similar in handedness than non-identical twins; why two right-handed parents can produce a left-handed child; and why two left-handed parents can produce a right-handed child. DDs have no chance of being left-handed, CCs have a 50 per cent chance, and CDs a 25 per cent chance.

Why should there have been fewer left-handers in Britain a century ago? Researchers have deduced that there were fewer C genes floating about in the population, which probably stemmed from cultural pressures. McManus speculates that left-handers, viewed as socially odd (the Latin for left is *sinister*), found it harder to marry and have children, or married later and had fewer children. As the stigmas of left-handedness has decreased, the proportion of C genes in the population has risen, leading to the current rates of left-handedness.

McManus, who would like to see a question on handedness in the national census, is as passionate about the difficulties faced by left-handers as he is about his science. He calls them the "last neglected minority".

"This Government has no idea how many left-handers there are in school, no idea whether they have special problems — and under the heading of political correctness, they don't want to know," he says. "On a practical level, look at power saws and microwaves — they are all designed for right-handers. I don't know whether left-handers scald themselves more taking stuff out of microwaves but it's possible. When you think about it, it's scandalous that we make complicated, potentially dangerous machines in a version that only 90 per cent of people can use properly. We are ignoring the health and safety of 10 per cent of the population."

'It's a scandal: we make potentially dangerous machines in a version only 90 per cent of us can use properly'



Chris McManus: new genetic theory

RICHARD POHLE

Right Hand, Left Hand by Chris McManus is published by Weidenfeld & Nicolson (hardback, £20). It is available from The Times Bookshop for £16 plus £1.95 p&p.

12 science

The handedness you're dealt

This trait can be either a blessing or a burden. On the plus side, it may confer mathematical or literary abilities. On the minus, it may cause difficulties with reading, writing and motor skills. The trait may even expose one to a higher rate of accidents.

The trail is self-handness, exhibited by about 12 per cent of the British population. The national statistics is significant — Eastern nations have lower rates of left-handedness, with only one in 25 Japanese going against the right-handed grain. It is more common among those that believe there are two left-handed feet for every four left-handed ones, slightly more common among historical men than historical women, and it is a property because characteristic (the other neural special orientation demonstrates handedness, brainwaves or preferences).

The origin of handedness remains an enigma, although scientists are beginning to piece together the complex story of how it may have arisen. One of the best figures is lateral dominance in Chris McCausland, professor of psychology and medical education at University College London, who has

The proportion of left-handers in Britain has risen fourfold in a century. Anjana Abujia explains a new theory of their genetic history

written *Right Handed, Left Handed*, a scientific and cultural account of some of life's quirkiest asymmetries. His genetic model of handedness can explain, among other things, why the proportion of left-handers in Britain has increased over the past century.

It is in the brains behind the theory of how we came to favour our left hand over the other, despite such disadvantages being placed on the closed neural networks. "The only two things we normally know are that things have a 50-50 split in handedness which is due to chance, yet 90 per cent of humans

handed", McCausland says. "We have somehow gone from one to the other, and we need to tell the story.

Somewhere along our evolutionary history he believes we departed from chance and edict of god to develop a gene for right-handedness (the called a D), for dextral. This was tilted on the development of language, which happened in only one half of the brain — the left hemisphere. McCausland, who is right-handed but whose mother was left-handed, explains "it would have been selected to get language in both hemispheres, because the corpus callosum is the bundle of nerve fibres connecting the two halves" it is being selected and inefficient. The cooperative writing such occurrences are fast and reliable, which is essential for language.

"Usually, the left hemisphere controls the right-half of the body, so the most basic motor functions all talk, such as hammering stone tools, left-handed stone tools developed. Two million years ago, when our ancestors were only chimpanzee-like, they were not even capable of either manual process, level of language to invent handedness.

The McCausland says, between one million and 2,000 years ago a second gene arose (called C for chance), which favoured left-handers to the right. The second gene is that this may have been a biological origin. "I don't remember it as being another part of gene being on the genome, what was modifying the

things in the right hemisphere, some of those function like motor to the other side", McCausland says. "You get things said by one that you wouldn't find in a right-handed brain; they are said in a different way which I think makes them advantageous.

"Language, for example having spatial facilities in the left hemisphere — this means that symbols and language are sent to each other. This is particularly good for being mathematicians. Although we are not sure the awareness of left-handed mathematicians could be as high as 20 per cent, there is certainly enough evidence to believe that left-handers and mathematical talent may be linked".

"However, having too much overlap between the two hemispheres — caused by a CC imbalance — may lead to 'bilingual brain', according to McCausland. This genetic combination may be at the heart of why autism, dyslexia and speech disorders such as stuttering are overrepresented in the left-handed population (the correlation are also much more common among boys).

Interestingly, gay men and children as young as seven who have predominantly gay friends — show higher rates of left-handedness than the general population, McCausland reports. "This may have a biological origin. 'I don't remember it as being another part of gene being on the genome, what was modifying the

Only 20 per cent of humans have any left-handed but half of children are



general handedness

gene. That may explain the genetic cross in autism, stuttering and dyslexia, and may also explain some of the things going on with homosexuality. Whether handedness really is down to combinations of C and D genes remains debated given the timing and sequence of any handedness gene remains a mystery. However, the number of descendants of left-handers in families fits the genetic model convincingly. The introduction of chance into handedness can explain why one identical twin can be left-handed and the other right-handed (McCausland's own identical twin daughters, Francesca and Azza, show this split) why

handed parents can produce right-handed kids. Dad may have a chance of being left-handed CCs have a 50 per cent chance and Ds a 25 per cent chance. Why should they have been left-handers in Britain century ago? Researcher has indicated that there were less C genes floating about in 17 populations, which included 16th century historical records. McCausland speculates that left-handers, viewed as socially odd (his Latin is left is more formal, it harder to marry as have children, or named too bad and few children, as if stigmas of left-handedness is decreased, the proportion of genes in the population has risen towards to the current rates of left-handedness.

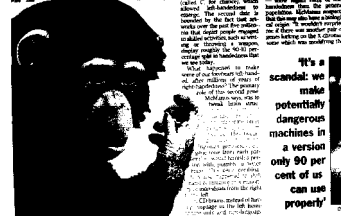
Maria, who would like to see a genetic test for handedness, says that the current rates are so accurate she could tell the sex of a left-handed man if he had his mother's name. "I'm not the best equipped scientist".

"This Government has ideas how they help handless. They are if designed for right-handers, they are if designed for left-handers. I don't know what left-handers could benefit from not having staff out of it as much as it is possible. Why you think about it, it's good that you do not have a job. We are sporting the health a variety of 10 per cent of a population.

Right-handed, left hand is 17 McCausland is published by Wiley and a number of books, £20. It is published by The Times, 18 March 2002, p. 10.

It's a scandal: we make potentially dangerous machines in a version only 90 per cent of us can use properly'

Christ McCausland, new genetic theory



Christ McCausland, new genetic theory