Lessons From Lefties
Search For Cause Of 'Handedness'
Yields Insights Into Genetics, Brain

By Faye Flam for the Philadelphia Inquirer
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Plato and Aristotle puzzled over left-handers, as did Charles Darwin. What determines "handedness"? Why are only 10 percent of us left-handed, and why did the ratio seem to change over the last century? Are lefties somehow different — less healthy, more creative?

With brain scanning and the latest genetic technology, scientists are finally starting to crack the mysteries. Left-handers really are special, and the ways they differ are yielding insight into human diversity — especially how one person's brain differs from another's.

Searches for a left-handed gene, meanwhile, are untangling the roles of "nature and nurture" in shaping our behavior and revealing ever more subtle ways that DNA can influence but not determine who we are.

"It's a quirky phenomenon of humans, and people ask why it's relevant," says research geneticist Clyde Francks of Oxford University. "But this is taking us into a fundamental feature of the human brain."

"Left-handedness is connected to a lot of neurodevelopmental disorders," says Daniel Geschwind, a UCLA expert in what is known as neurobehavioral genetics. People with autism and schizophrenia are more likely to be left-handed, he says. "But with that risk, there is also gain."

Look at MIT professors or musicians or architects, he suggests, and you'll see a slightly higher percentage of left-handers than in the general population. Neuroscientists are beginning to figure out why.

The brains of left-handed people develop more freely in utero, they say, allowing the organization to stray more from the standard design.

In most people, experts say, the left hemisphere of the brain specializes in tasks that are performed in sequence, such as reading and speaking; the right does more holistic processing, like that needed for visual perception. Most people have a dominant left hemisphere, and since each hemisphere controls the opposite side of the body, most of the population is right-handed.

For years, many psychologists assumed that lefties' brains were reversed, with language capacity concentrated in the right side of the organ. Subsequent work shows that is sometimes the case — but not always.

A large body of research shows that the majority of right-handers follow the typical pattern,

using the left hemisphere for language. Left-handers' brains appear less predictable: About half have language abilities concentrated in the left, 10 percent in the right, and 40 percent make use of various regions on both sides.

Many animals are right- or left-pawed, or -footed or -flippered. Mice, for example, will consistently use either the right or left paw to press a lever. Unlike humans, however, most species are divided 50-50.

"Years ago, geneticists tried to breed left- and right-handed mice," says Chris Walsh, a neurologist at Harvard Medical School and the Howard Hughes Medical Institute. The offspring were still evenly divided.

In humans, handedness runs in families, though not in an easily predictable way. Left-handers are about twice as likely as righties to produce left-handed children, but most of their offspring will still be right-handed.

A few years ago, UCLA's Geschwind scanned the brains of identical twins, hoping to understand the connection between handedness, heredity and brain structure. He found that pairs of right-handed twins tended to share a more asymmetrical brain structure than did left-handed pairs or mixed sets.

The finding backed the idea that genes either drive the developing brain toward right-handedness or leave it to chance.

No single right-handedness gene has turned up, despite many efforts to find it. Three months ago, however, a team led by Oxford's Francks discovered a gene that may at least play a role. They found that left-handers tend to share a variant of the gene they named LRRTM1, but it appears to influence handedness only if it is inherited from the father. (Genes whose dominance is contingent upon which parent contributes them make up about 1 percent of the total in humans.)

In either form, this gene is active in the developing brain. "It influences the way different regions wire up and find connections," Francks says. Its effect on determining handedness is small, and the geneticist believes several yet-to-be discovered genes are also involved.

Environmental factors — stigma, social pressure, possibly hormones — could nudge people one way or the other as well.

Other scientists are examining how LRRTM1 and other genes might tie left-handedness loosely with all sorts of characteristics. Various studies have found weak but statistically significant associations between left-handedness and schizophrenia, autism and even homosexuality.

A few scientists say their colleagues are looking at the mystery of handedness from the wrong perspective.

University of Toledo psychologist Stephen Christman was trying to connect handedness with

preference for types of musical instruments when he made an unexpected finding: People who were very strongly right- or left-handed preferred keyboards and drums, while those who were more ambidextrous gravitated toward strings.

"I realized that maybe what's important is not left or right but strongly one-handed or mixed," he says.

There is some evidence, he says, that mixed-handers have a wider connecting pathway — called the corpus callosum — between the right and left hemispheres. Having a wider connection seems to make it harder to do more than one thing at a time — playing a different rhythm with each hand, for example.

Christman has found that strong right- or left-handers, on the other hand, are more likely to hold to set beliefs, such as creationism. He speculates that communication between hemispheres helps people revise beliefs.

None of this suggests mixed-, right- or left-handers have a corner on creativity or genius. Researching an essay on the lefty guitarist Jimi Hendrix, who famously played a right-handed guitar upside down, Christman made a shocking discovery: the much-photographed Hendrix held a pen with his right hand.

It makes sense, says Christman, himself a left-handed guitarist, if you consider that in "right-handed" guitars, the left-hand job of working the frets has grown increasingly difficult as both styles and design have evolved.

So why not see how it works the other way around?