

The Right Hand Explains What the Left Hand Is Doing

There is an old riddle that remains mysterious even after it is explained: "If a mirror reverses right and left, why doesn't it also reverse up and down?" The body facing us in a mirror, for example, raises its left arm when we raise our right; ordinary writing is also reversed in direction. Yet there is no similar reversal when we shake our heads. However topsy-turvy the looking glass world appears, one can stand upright in it with some confidence.

But the riddle's premise is wrong. The mirror doesn't actually reverse right and left. When we raise a right hand, the mirror doesn't show a hand raised on our left. As Chris McManus explains in his remarkable new book "Right Hand, Left Hand," a mirror actually reverses front and back. If we hold an object up to a mirror, the part that is closest to us is made farthest away. As the physicist Richard Feynman explained, the only reason mirror writing is reversed is that we have *already* reversed it by rotating the paper when we hold it up to the mirror. Write on a transparent piece of glass instead, and the reflection will be as readable to us inside the mirror as outside.

This explanation will not be immediately satisfying, but Mr. McManus, who is a professor of psychology and medical education at University College London and has devoted much of his career to the study of right- and left-handedness, suggests that this confusion may have as much to do with our lack of perspective about right and left as about mirrors themselves. We hardly understand the nature of these directions, let alone the role they play in biology, cosmology and sociology. We either ignore them or distort them.

Mr. McManus attempts to put them in their proper place, with graceful and lucid prose, as he outlines his theory of right- and left-handedness. Along the way there is also much exotica: Australian drug addicts licking toad skins, the driving customs of Iceland, the twists of twine in a prehistoric arrow, Charlie Chaplin's left-handed cello and

RIGHT HAND, LEFT HAND The Origins of Asymmetry in Brains, Bodies, Atoms and Cultures

By Chris McManus

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van Gogh's reversed lithograph of left-handed potato eaters.

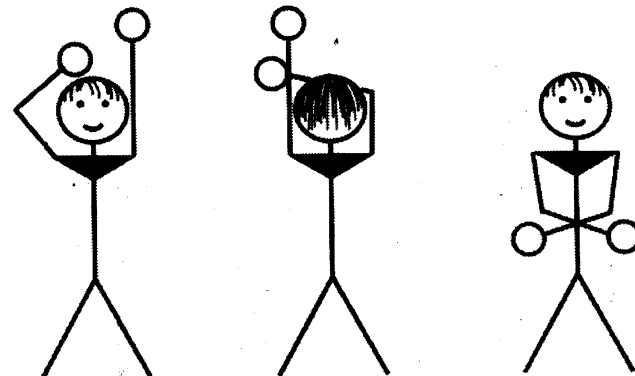
What, Mr. McManus asks throughout, is the nature of the difference between right and left? Do these words have any universal meaning? Even without mirrors, the words confuse: Freud used to identify his right hand by recalling which he used for writing. Feynman had to consult a mole on his left hand.

Yet the difference is biologically essential. Our hearts are on our left sides; other organs are also distributed asymmetrically. Even the brain's two hemispheres have different functions. In addition, our body relies on sugars and proteins that have a distinct direction in their three-dimensional structures; mirror images of these compounds would not support human life; some can destroy it.

And then there is the matter of "handedness": why should there be such a preference, let alone such a small minority (about 10 percent) of "lefties"? Plato thought it was "due to the folly of nurses and mothers".

But Mr. McManus argues that there is a strong genetic component that helps explain the remarkably consistent proportion of left-handed preference in the human population. In a survey of a thousand statues and illustrations going back to 3000 B.C. only about 8 percent showed the use of left hands. An analysis of marks on tools at an archaeological site in Belgium dating from 9000 B.C., suggests that about 5 percent were used by left-handed workers.

Yet these proportions can also change. Mr. McManus shows that the proportion of left-handed people in England increased dramatically during the 20th century, to



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Which hand is the right hand? Using figures in different poses, this test for children and adolescents requires a full understanding of right and left.

more than 11 percent from a low of about 4. Meanwhile in India, he says, the number remains about 5.8 percent, with 4 percent in Japan and 7.9 percent in Ivory Coast.

Here, he suggests, is where the folly of culture comes into play, for in these varied cultures there are differing attempts to convert the left-handed and different methods for shunning them. But the antipathy has been universal. Mr. McManus writes, "In any historical period or in any culture, right and left have their symbolic associations and always it is right that is good and left that is bad."

Until this century, for example, many European schools required that writing be learned with the right hand. The Zulus, Mr. McManus points out, have another technique: if a child shows the wrong preference, a hole is dug in the earth, boiling water is poured in, and the child's left hand is submerged.

Left and right have also been associated with gender: the right hand with the male and the left with the female. In cultural symbolism, the Left typically inverts and subverts the Right. The word sinister, after all, comes from the Latin reference to the left hand. A "left-handed wife," Mr. McManus notes, is a mistress, a "left-handed opinion" is a weak one, and a "left-handed sugar

bowl" — in a complete inversion of sensation and direction — is a chamber pot.

Mr. McManus doesn't go far enough in explaining this antipathy. But he suggests that the stigma of the "left" also grows out of an objective distinction. There are differences in the brains of the left-handed, in some cases conferring unusual advantages as well as vulnerabilities. He proposes that the evolutionary development of a gene associated with left-handedness may have led to more flexibility in the organization of the human brain and more resilient distribution of its powers.

And so in this book body and mind are linked, as are nurture and nature. The biological distinctions between left and right, Mr. McManus suggests, may also have had their origins in the particular variety of mirror-image proteins found on earth, which have also been found to prevail on meteorites, and which may or may not have something to do with neutron stars and the origins of life.

What a strange world is shown in these speculations: the left is a mirror of the right, but they do not resemble each other. And in their reflections Mr. McManus also manages to find the whole.