

Lateral thinking

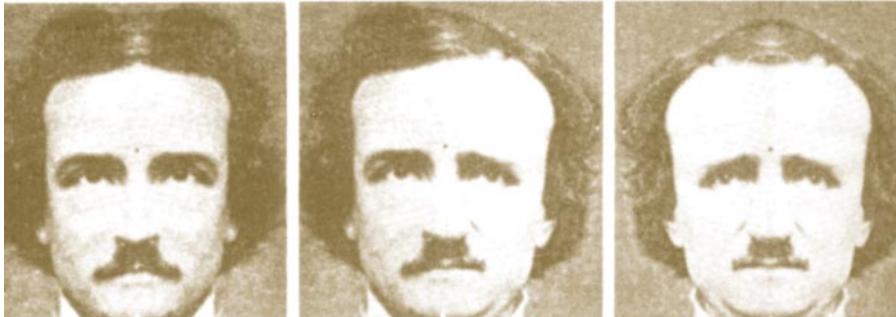
A handy guide shows that there's more to left and right than meets the eye.

Right Hand, Left hand: The Origins of Asymmetry in Brains, Bodies, Atoms and Cultures
by Chris McManus
Weidenfeld & Nicolson: 2002. 256 pp. £20,
\$27.95

William D. Hopkins

The causes and consequences associated with right- and left-handedness have been the focus of a growing body of research in the past 20 years. Indeed, laterality now even has its own journal: *Laterality: Asymmetries of Body, Brain and Cognition*, published by the Psychology Press. The scope and range of scientific disciplines now investigating laterality is the subject of this wonderful book by Chris McManus. Although its title implies that the focus is on handedness, don't be misled, for there is much more in this volume. The range of topics that it covers is far-reaching, and readers from a wide range of disciplines including physics, biology, chemistry, neuroscience and psychology will all find some aspects of the book intriguing from their own perspective.

Those who appreciate the history of science will not be disappointed either. McManus goes to great lengths to present a historical context for each of the topics discussed, and shows how the various disciplines are related and were often considered by our scientific founding fathers. He discusses topics ranging from asymmetry in the structure of amino acids to the socio-linguistic origins of the words 'left' and 'right'. He treats readers to a diverse set of observations, such as the fact that the skin of certain species of toad is extremely psychoactive because of differences in the distributions of left- and right-handed



Taking sides: composites of the halves of Edgar Allan Poe's face (centre) highlight human asymmetry.

amino acids. And there is a wonderful discussion of the religious and political meanings of 'right' and 'left' in relation to the origins of such words as 'sinistrality' or the common reference to the left hand as the 'sinister' one.

McManus begins by describing a patient who exhibited situs inversus, a medical condition in which an individual has the organs reversed, with, for example, the heart on the right side instead of the left. The patient is right-handed, a point that serves as the juxtaposition for much of the book. Most people are right-handed and most people have their heart on the left side of the chest cavity. Therefore, because individuals with situs inversus have reversed organ asymmetries, one might assume that they would be left-handed. Modern research has shown that this assumption is wrong, but the example is revealing because it extends the concept of laterality beyond the traditional realm of handedness. The right-handed situs inversus patient represents the dual definition of laterality, defined first as a morphological phenomenon and secondly as a behavioural and functional process. Each

form of laterality is autonomous from the other, but both are equally puzzling in terms of their origins.

From this basic premise, McManus begins by describing the historical and philosophical questions of why asymmetry exists. In particular he discusses the deeper question of right and left as absolute or relative degrees of space. Right and left are relative to the perspective of the viewer, so one need look no further than into a mirror to understand the fundamental problem.

In his discussion of the origins of human handedness, McManus presents a fair and representative review of various genetic, developmental and cultural models of handedness that have arisen over the years. He uses his own genetic model to explain individual variation in the expression of right- and left-handedness as well as variation between different cultures. Finally, he discusses several myths, misunderstandings and idiosyncrasies of left-handedness. For example, it is noted that a significantly higher proportion of left-handed individuals have been president of the United States compared with the population as a whole, and that left-handed individuals do not really have a shorter lifespan than right-handed individuals, as some believe.

This part of the book is a sometimes amusing, light-hearted addition to the otherwise empirically driven arguments in the preceding chapters, and many readers will find them both delightful and informative. I was disappointed that greater attention was not given to the plethora of recent findings on limb preferences in animals, including lower and higher vertebrates. Although some of these findings are referenced and briefly discussed, they are not fully presented — a shame in a book that purports to describe the origins of handedness. However, several recent books have been dedicated to the topic of behavioural laterality in animals, such as *Comparative Vertebrate Lateralization* (Cambridge University Press,



2002) edited by Lesley Rogers and Richard Andrews. Perhaps McManus opted not to include a lengthy discussion in his book to save space and to avoid distracting readers from the larger issues at hand.

Minor criticisms aside, he has done a marvellous job of summarizing and integrating a wide range of findings from various disciplines addressing questions on the nature of right and left. The presentation and clarity of the topics is palatable to both the scientific and lay communities, making this volume well worth reading. ■

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Controlling a generous host

Parasites and the Behavior of Animals

by Janice Moore

Oxford University Press: 2002. 338 pp. £65, \$85 (hbk); £24.95, \$45 (pbk)

Paul Schmid-Hempel

In the early 1980s, a paper in *Scientific American* explained that a pill-bug (or woodlouse) is not always a pill-bug because its behaviour may be dramatically changed by an internal parasite to suit the latter's selfish interests. Although this was not the first summary of such parasite-induced alterations of host behaviour, it arrived in a climate of a suddenly increased awareness of the role of parasites in host ecology and evolution. Since then, the field as a whole has witnessed an unprecedented increase in the number of studies and publications.

Contrary to earlier beliefs, research over the past two decades has shown that parasites are not the exotic case nor a dull, degenerate lot that seek a harmonious coexistence with their hosts. Rather, parasites are ubiquitous and are continuously, relentlessly coevolving to overcome their hosts' defence systems. Parasite strategies, too, are governed by short-term fitness maximization even if it means that the host is not always killed or made sick. In doing so, parasites face the central dilemma of inflicting damage to the current host while still needing transmission to the next — a problem elegantly captured in Roy Anderson and Robert May's classical equation for R_0 , the parasite's net reproductive rate.

Even though we are still far from a comprehensive understanding, the application of such population and evolutionary thinking to host-parasite interactions is a success story. Strangely, as the field progressed, investigations into how and why parasites



Tripping the light fantastic

In the 40-odd years since Yuri Gagarin was the first man in space, some 400 others — including Linda Godwin (left) and Jerry Ross, shown above in the weightless conditions on board *Atlantis* —

affect host behaviour fell behind. Janice Moore, the author of the *Scientific American* paper on pill-bugs, now sets out to correct this imbalance.

Her book is a gripping account of the sometimes spectacular behavioural (and morphological) alterations caused by parasites. She concentrates on infections by helminths ('worms'), such as nematodes, cestodes and trematodes, but regularly discusses fungi and protozoa too. Did you know that the first experimental demonstration of how tapeworms infect humans was made with the help of the guillotine? (See p. 20 of the book if you want the gruesome details).

Moore's writing is witty and conveys the flavour of her deep interest in beasts that most people like to avoid. Her organizing principle, which unfortunately is not carried through consistently, is the equation for R_0 . In fact, altered host behaviour directly affects most of the equation's variables. For example, many parasites render the host fearless. This increases the probability that the current host will be eaten by a predator that may then serve as the next host. Conversely, host avoidance behaviour reduces the risk of infection. Both processes change the numerical value of the transmission rate in the basic equation. Moore does not restrict herself to simple behaviours, however, but sensibly includes changes in life-history parameters, too. For example,

have made the same remarkable journey. Serge Brunier looks back at the highs and lows in *Space Odyssey: The First Forty Years of Space Exploration* (Cambridge University Press, £25).

behavioural fever and behavioural chill, in response to infection, each reduce mortality rates and may accelerate recovery.

For the population biologist, behavioural alterations count if the parameters of the equations vary. Behaviourists like to trust their interpretation of the meaning of an observed behaviour. Physiologists want to know how parasites achieve their manipulative tricks. Moore's treatise gives all sides something to chew on, but it does not generate many new concepts to fill the gaps.

To pick a few faults, figures are not always attractive or well explained, quotations are occasionally unfortunate, and there are some unnecessary repetitions. But these minor shortcomings aside, the book is a pleasant read (even though some examples can send chills up your spine), a highly stimulating survey of the field, and certainly a reference for years to come. Everyone with a general interest in biology who can still be amazed by the awesome power of natural selection should look at this book. Along the way, you will learn many things and perhaps come up with a question that might change your own research. In this sense, the book is an important step. Hopefully, the next such step is not another 20 years away. ■

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