

such a task. It grew out of a request by Bethe to Gerry Brown to explain his physics to the world; Brown and Chang-Hwan Lee edited this book. It makes no claim to be a comprehensive biography — it is more like a taster menu drawn from half-a-dozen different restaurants. Like Bethe's work, the chapters range from extremely detailed physics to non-technical consideration of some of the biggest issues facing humanity. Much fascinating insight into some of the key figures can be gained without any scientific background, but some chapters require a knowledge of physics to degree level or beyond. A few of the later articles have a faint echo of axes being ground, but a book with no trace of controversy would be a poor reflection on Bethe's life.

I would especially recommend the book to

anyone who has been involved in any way with the events described, as it brings alive many of the physicists that some of us knew only slightly, or by reputation alone. Reading about Bethe's pure pleasure as he bulldozed problem after problem using the simplest tools he could get away with was an inspiration — I wanted to grab a piece of paper and have a go myself. He kept that pleasure to the end. A colleague who gave a seminar at Cornell in the week of Bethe's death told me that Bethe closely followed the talk and obviously enjoyed it. His last words to a younger physicist, quoted in one of the best and most touching articles in the book, were simply "Carry on". We will, Hans. ■

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fleshy ornaments can be condition dependent, and so provide potential mates with reliable information about quality.

It is surprising that until only a decade ago, the study of avian coloration proceeded in ignorance of colour science. A mini-revolution has since occurred in how colour is considered, measured and analysed in behavioural, ecological and evolutionary studies of birds. This change is reflected in *Bird Coloration*. Previously, almost all studies of avian coloration were made on the assumption that birds see colours in much the same way as humans. This assumption was flawed. We now know that many, if not most, diurnal birds are sensitive to ultraviolet wavelengths, to which humans are blind. Moreover, colour vision in birds arises from four classes of retinal cone cell, whereas humans have only three, probably giving many birds an extra dimension to their colour vision. In addition, experiments have shown that ultraviolet reflectance and illumination invisible to humans influences birds' decision-making in several contexts, including mate choice, foraging and provisioning chicks.

The two volumes of *Bird Coloration* provide an excellent up-to-date overview of the topic. Despite having 20 contributors (including many prominent people in the field), the book is generally well focused, although the editing could have been tighter in places.

The science of bird coloration today is genuinely interdisciplinary, drawing on behaviour, ecology, pigment chemistry, the physics of light, the microstructure of reflectors, physiology, immunology, molecular genetics and vision research. Most of these areas are well represented in the book. I particularly enjoyed the chapters on topics that have had relatively little attention in the past few years, such as the numerous non-sexually selected functions of avian coloration. These also provide a reminder of the many issues that remain to be unravelled. Consider, for example, even well-studied species, such as the zebra finch or the blue tit. There are still no convincing explanations for their combinations of

A bird's-eye view

Bird Coloration: Vol. 1, Mechanisms and Measurement; Vol. 2, Function and Evolution

edited by Geoffrey E. Hill & Kevin J. McGraw

Harvard University Press: 2006.

Vol. 1, 544 pp, £59.95; Vol. 2, 496 pp, £59.95

Andrew T. D. Bennett

Who can fail to be beguiled by the extravagant plumage colours of birds of paradise, peacocks and parrots? But there's more to feathers than showy displays. These remarkable, lightweight structures, which evolved 150 million years ago, perform a range of functions, both within individuals and across species. For example, they are one of the best thermal insulators known; they have several aerodynamic properties, creating refined aerofoil structures, producing lift and reducing drag; they can be waterproof; they are resistant to wear and abrasion, and are self-repairing; they perform a wide variety of sensory functions; and they create humid habitats for parasites and symbionts. Finally — and this is the focus of *Bird Coloration*, a two-volume work edited by Geoffrey Hill and Kevin McGraw — feathers produce a plethora of colours that demand an evolutionary explanation.

Simply put, an animal's coloration results from a trade-off between crypsis, for protection from predators, and gaudiness, for mating advantages. But the whole story is much more fascinating, and understanding it requires a firm grasp of both sexual-selection theory and colour vision. Sexual selection is a term coined by Darwin to explain the evolution of traits — often extravagant ones, such as the peacock's tail — that appear to confer disadvantages in natural selection but offer mating advantages. It was largely ignored for more than a century, but over the past three decades it has been one of the most intellectually vibrant areas

of evolutionary biology. Its powerful body of theory now provides evolutionary explanations for a vast range of behaviour, ecology and life-history variation. For example, in humans it can explain mating patterns and even sporting and musical aptitude.

The test-bed for much of the work on sexual selection has been birds and their coloration. Why? Birds have grabbed biologists' attention in a way that nematodes have not, so there is a vast knowledge base on which to draw. In addition, the gaudy coloration and extravagant displays of birds require explanation and are amenable to testing. Vision plays a key role too — indeed, birds have perhaps the most advanced visual system of any vertebrate.

An explosion of interest was fuelled in the early 1980s by Bill Hamilton and Marlene Zuk's remarkable theory that much bird coloration evolves from sexual selection on traits that indicate condition, particularly disease status and heritable resistance to parasites. Many studies have since showed that feathers and



Putting on a show: a peacock displays its colourful tail.

G. DOUWMA/GETTY IMAGES

colours and their proximity and areas.

Colour science is an important but complex subject. Those studying behaviour and ecology are now taking this on board, as several chapters demonstrate. How are receptor signal-to-noise ratios dealt with, and does the Vorobyev and Osorio model best describe most avian colour spaces? What are the advantages and disadvantages of the different approaches to analysing reflectance and illumination spectra, and how do these vary with the different level and type of biological questions posed? How

precisely are different cone inputs combined and weighted? What is the taxonomic distribution of spectral sensitivity in birds? How are photonic crystals genetically coded? These are all areas of current intrigue, and quite a few are well covered here.

A sound understanding of colour vision, then, underpins our understanding of bird coloration. This can be a knotty area, with most hard evidence coming from colour-mixing experiments, retinal physiology and sequence data, so contributors specializing in these areas

would have been welcome. However, bird coloration is a huge topic and anyone organizing an overview should be heartily congratulated.

Another overview can be found in a special issue of *American Naturalist* due out this month. Both publications offer much for those studying coloration in other taxa too, because birds provide model systems for investigating animal coloration. Besides, birds are just so exquisitely beautiful. ■

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A cultural state of mind

The Culture of Our Discontent: Beyond the Medical Model of Mental Illness

by Meredith F. Small

Joseph Henry Press: 2006. 224 pp. \$27.95

Lewis Wolpert

In medieval times, madness was regarded as a moral perversion or even satanic possession. There has since been a continuous increase in the use of drugs, from alcohol to antidepressants. The current culture of using pharmaceuticals to treat mental illness concerns the anthropologist Meredith Small. In *The Culture of Our Discontent*, she examines how such illnesses are viewed in different cultures, and whether, for example, shamans and sorcerers might be able to suggest useful treatments. Much of the book is based on interviews with psychiatrists and anthropologists, and it provides a novel approach to mental illness.

However, Small underestimates how successful talking therapies, such as cognitive therapy, have become. In my view, psychoanalysis, by contrast, is not far removed from witchcraft. One of the problems facing talking therapies is that it is very difficult to do a double-blind clinical trial.

A relatively new approach to psychiatry is based on darwinian evolution. For example, depression is both disabling and common, and has a significant genetic component, so why has it not been selected out? Might depression have a useful function? Could it be a cry for help, or prevent people from pursuing unattainable goals? Most plausible is that sadness is an essential and adaptive human attribute that has become abnormal, much as cancer cells are normal cells that have become malignant. Similar questions relate to schizophrenia. Does it give someone the advantage of not needing social attention, for example? I don't find this persuasive, however. More relevant, I suggest, is the view that it involves key cognitive processes, such as insight and empathy, that have become abnormal.

Small describes how Harry Harlow used monkeys in the 1950s to try and understand depression. He found that infant monkeys separated from their mothers showed behaviour



A. POHL/STILLPICTURES

Cultures such as the Aymara in South America have different views of mental illness to the West.

that could be thought of as depression. There was also a strong genetic component. However, they recovered when placed with other young and affectionate monkeys.

Central to the book is the extent to which culture influences the types and incidence of mental illness. Unfortunately, little good evidence is provided in relation to Western illnesses in other cultures, probably because they are not easy to diagnose. There is a widely accepted claim, for example, that the incidence of schizophrenia is 1% in many different cultures. However, depression is rare in the cold wastes of Iceland, and the number of teenage suicides is growing in Colombia.

Culture, like genes, is handed down and affects behaviour. It also determines what is considered normal. In one Native American community in California, seizures were respected, and in Siberia, many shamans are neurotic. In Botswana, an anthropologist saw a woman suddenly rip off her clothes and run into the bush. Quite slowly, a man went after her and they returned calmly. The locals explained that sometimes people had to do that. In southern China, koro, the male fear of losing the penis, can reach epidemic proportions. By contrast,

anorexia is entirely a Western condition and may be related to affluence. Agoraphobia is also Western — there is less need to run for cover in the jungle.

In China there were no acknowledged cases of depression under Mao, but Arthur Kleinman found that patients suffering from neurasthenia — aches and pains — had the characteristics of depression. Such somatization is also common in depressed patients in the West, but this is not explored here.

As Small points out, there are no reliable data on the diagnoses or remedies for different mental illnesses in different cultures, but in the non-Western world there is usually someone to blame, often guided by a witch. Small notes that in Western culture we do not tend to believe in curses, voodoo or magic, but what about religion and much of alternative medicine?

The examples of mental illness in different cultures raise many interesting problems and require further research. We also badly need to improve our understanding of the biology of mental illness, and then the cultural influences may become clearer. ■

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