insurance companies better to discriminate against potentially costly clients.

The dangers are amplified by an uncritical embrace of the science on which some of the diagnostics rest. Employers have been known to screen job applicants for characteristics — sickle-cell trait or pregnancy, for example — that are irrelevant to hazards in the employers' workplace. Depending upon the test, screening of a random population can yield a comparatively large number of false positives. Identification of a genetic risk for a disease such as manic depression is often taken to mean a genetic certainty to succumb; similarly with aberrant brain patterns. In both cases, the complex etiology of many diseases is ignored in favour of single-cause assessment and economic, social or medical stigmatization.

In the view of Nelkin and Tancredi, the diagnostic dangers revive an old theme — a propensity to medicalize socio-economic misfunction, to locate its principal causes in purely biological traits. In the ancient debate between nature and nurture, nature, they say, has recently been declared the winner. Blaming biology lets society or its constituent institutions off the hook; it permits them to segregate problems rather than deal with them. It fosters the construction of social categories — 'high-risk' employees or 'learning-disabled' children — and places them beyond the reach of meliorative social policy. Nelkin and Tancredi write, "By focusing attention on the physical state of the brain, educators may neglect the social and economic conditions leading to damage. By dealing with the biological characteristics of individuals, rather than the social causes of problems, schools set up solutions that insulate them from responsibility while enhancing their immediate control" (p.130).

Yet it should be remembered that diagnostics need not result in a deterministic medicalization. Identification of a biological handicap can make possible compensatory environmental remedy. It can also help society more knowledgeably define where it wishes to set the limits — do haemophiliacs have an inalienable right to employment as butchers? — of regulatory or environmental accommodation. One wishes that Nelkin and Tancredi had given more attention to the technical quality of the new diagnostics, especially of the neurophysiological variety: technical reliability must inevitably figure in assessments of their appropriateness. One wishes, too, that they had explored more extensively the genuine challenges and trade-offs with which the new diagnostics confront society; for example, how the costs of risk should be allocated as risk becomes more sharply specified; or how institutional interests should be balanced against individual rights, particularly rights to education,

employment, health care or privacy.

Not least because it points to the need for such explorations, *Dangerous Diagnostics* is an important and timely book, a thoughtful and informative provocation to debate. It is also a pathbreaking one, for its recognition that while the diagnostics may be applied across a broad informational and institutional spectrum, their increasing uses raise a class of social and political issues that are general, and generally disturbing. For as Nelkin and

Tancredi apprehensively declare, "If biological tests are used to conform people to rigid institutional norms, we risk reducing social tolerance for the variation in human experience. We risk increasing the number of people defined as unemployable, untrainable, or uninsurable. We risk creating a biologic underclass" (pp. 175–76). □

Daniel J. Kevles is in the Division of the Humanities and Social Sciences, California Institute of Technology, Pasadena, California 91125, USA.

The price of sex

Rory Howlett

Sexual Selection. By James L. Gould and Carol Grant Gould. W.H. Freeman: 1989. Pp. 277. £16.95, \$32.95.

SEX is costly and in many ways disadvantageous, yet almost all species alive today reproduce sexually. Others, however, are either asexual or alternate between sexual and asexual phases, suggesting that there is a fine balance between the costs and benefits of sex.

The subject is a controversial one, attended by a host of unanswered questions. In this addition to the Scientific American Library, James and Carol Gould set out to explain the roles that sex (technically, the recombination of separate sets of genes) and mate-acquisition

concentrates on the ways in which selection has affected the lives of sexually reproducing species, from non-social insects to the most social of all species, us. Here there are entertaining accounts of how animals choose and woo their mates, and how they use even the most devious of means to ensure that their genes are propagated in future generations; indeed, as has become almost obligatory since the publication of *The Selfish Gene*, a gene's eye view is taken throughout.

As the Goulds point out, the special challenge of behavioural ecology is to explain why there are so many different social organizations in the animal world, and why each species structures itself in the way it does. A particularly satisfying aspect of the book is the way that different social organizations are compared and related to the differences in habitat and niche; resource distribution and availability have a central role in determining the level of sociality that evolves.

Even within a species, individuals often vary in their behaviour, and it was previously believed that minority behaviours were somehow deviant. The authors do a fine job of explaining how frequency-dependent selection can give rise to a stable mixture of 'strategies' within species, an idea that has derived in large part from game theory. Equally well covered is the contentious topic of the evolution of female choice and its role in selecting for apparently disadvantageous (in terms of natural selection) male secondary sexual characters such as the tail of the peacock. Finally, we have a thought-provoking (and unashamedly 'sociobiological') account of the role of sexual selection in shaping human evolution and culture.

The Goulds write clearly yet with authority (both are involved in research on sexual selection) and lace the text with many fascinating facts and examples. Their book will do nicely for students and others with an interest in the subject. □

Rory Howlett is an Assistant Editor of *Nature*

Like the Red Queen — running as fast as you can to keep up.

strategies have had in the lives of organisms from bacteria to human beings, and to tackle some of those many questions.

The Goulds start by summarizing the origin and maintenance of sex, placing it squarely in the context of modern evolutionary thinking. Working on the assumption that there must be a powerful logic to explain the near ubiquity of sex, they compare and contrast an "embarrassment" of plausible hypotheses. Their conclusion is that, at the outset, the role of sex in genome repair was probably of overriding importance, while selection in response to ever-changing challenges (red-queen evolution) is likely to be the main factor maintaining sex in most modern species. The rest of the book con-