

and 1985), mirror what has happened to British technology and industry in general.

Part 2 describes in greater detail some of the instruments developed by the company, from the automatic microtome ('Darwin's Rocker' of 1885) to the Cambridge cardiograph and Wilson's cloud chamber. Some of these devices have had a remarkably long life, and in the 1950s the firm became rather conservative in its designs, resisting for instance the introduction of electronics — as one of the old workmen put it: "This isn't instrument

work — it's ironmongery!"

Horace Darwin's Shop is of interest both as a company history and for its accounts of developments in scientific instruments. It deserves a wider readership than the 'buffs' interested in katharometers, photobustoscopes (Darwin's name for a camera system for recording explosions), photonephometers and auxanometers. □

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Beastly behaviour

Tim Clutton-Brock

Ecological Aspects of Social Evolution: Birds and Mammals. Edited by Daniel I. Rubenstein and Richard W. Wrangham. Princeton University Press: 1986. Pp.351. Hbk \$65, £43.40; pbk \$23.50, £15.70.

AS THE diversity of animal social behaviour became apparent in the 1950s and 1960s, interest was initially concentrated upon the reasons for differences between species. Research in this area crystallized when, in 1964, John Crook demonstrated that variation in sociality and breeding behaviour among weaver birds was consistently related to differences in habitat type and diet. Subsequent analyses revealed similar correlations between social behaviour and ecology in many other groups of vertebrates.

Crook's approach to understanding the adaptive significance of gross differences in social behaviour by investigating associations between species differences in ecology and social behaviour was termed socioecology. In the mid-1970s, it was largely (though not totally) eclipsed by the birth of sociobiology with its associated emphasis on the reproductive strategies of individuals. This generated a new wave of field work which focused on the competitive and cooperative interactions of individuals within groups, revealing new orders of complexity in social behaviour.

Ecological Aspects of Social Evolution marries the sociobiological and socioecological approaches in an attempt to understand the adaptive significance of species differences in social behaviour. The first section consists of eight chapters describing the behaviour of primarily monogamous or polyandrous species or groups, while the second includes nine chapters on polygynous animals and one on human breeding systems. Most of the authors use detailed studies of single species as a springboard for explanations of differences in social behaviour between related species. The contributions are of a uniformly high standard, and together they provide an illuminating view of

recent research on the subject.

Two themes recur throughout the book. The first is the extent to which social and reproductive behaviour are influenced by demography. For example, the retention of juveniles or subadults as helpers within the parental territory is usually associated with low adult mortality rates and a corresponding increase in the costs of dispersal in saturated environments. An increase in adult mortality (either within or across species) is commonly associated with an increase in dispersal and a reduction in group size and the number of

the evolution of social behaviour are repeatedly forced to invoke costs and benefits which can be guessed at but seldom measured directly, and, instead, we are left to rely on indirect evidence. While this can be compelling, it rarely allows us to compare the strengths of different selection pressures and it is often difficult to distinguish credible arguments from castles in the air. For example, in primates there is not much direct evidence to support the oldest of all explanations of sociality: that grouping reduces predation rate. This lack of evidence has been used to imply that social advantages of grouping predominate. But consider the probability of a field worker demonstrating an association between group size and predation rate in a population of animals where most individuals live for ten years and 50 per cent are eventually killed by predators. It is rare for a researcher to average more than 200 hours of observation a month and be able to monitor more than 20 animals at a time. Even if we assume that predators only attack by day, a field worker will only witness *one animal being killed every year*. Under such conditions, it is virtually impossible to produce

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In at the kill — but lionesses may be social animals for reasons other than hunting.

helpers. Such findings emphasize that many apparently species-specific aspects of social behaviour may be flexible responses which can vary with local environmental conditions.

The second theme is the extent to which diverse aspects of social behaviour may be adapted to the behaviour of conspecifics rather than to food distribution or predation, the two ecological parameters most commonly considered by socioecologists. Among felids, for example, lions are the only species in which females are social. It has often been suggested that grouping in lionesses represents an adaptation to maximizing hunting success. However, Packer's results, summarized in the penultimate chapter, show that meat intake declines with increasing group size. The main benefit of sociality, he suggests, is that by increasing pride size lionesses increase the tenure of resident males and reduce the frequency of infanticide.

The book, however, allows little room for self-congratulation amongst those of us working in this field. Arguments about

direct evidence that the frequency of predation declines with increasing group size, and the absence of such evidence cannot be used to suggest that predation is unimportant as a cause of sociality.

As Wrangham and Rubenstein point out in the final chapter, long-term studies of the reproductive costs and benefits of different social strategies will be needed to provide firm evidence of adaptive explanations of variation in social behaviour among birds and mammals. In particular, parallel studies of the fitness pay-offs of different strategies in related species with contrasting social systems may provide revealing insights into the adaptive significance of species differences, while, at a different level, quantitative interspecific comparisons will continue to play an important role in allowing us to test hypotheses about gross differences in social behaviour. □

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