

Preface

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PREFACE

The peacock's train, the song of the nightingale, the colourful wing of a butterfly and the croak of a frog must be among the most striking of the products of evolution. They are all signals, part of a much larger array of animal signals that function in a wide range of contexts: sexual, defensive, aggressive or social, for example, and use all available signal channels. Despite this diversity animal signals can be considered a coherent class of characters, distinct in terms of evolutionary dynamics from many other characters. This is because the selection pressures operating on a signal depend primarily on the properties of the receivers, rather than on the environment, and, furthermore, there is a reciprocal effect of signal characteristics on receiver evolution.

The intention of this symposium, and the Discussion Meeting held at the Royal Society on 28 and 29 October 1992 on which it is based, was to emphasize the common thread of signal–receiver coevolution by considering ‘signalling systems’. These systems might be expected to share features whatever the context in which they operate, and whatever the channel they utilize. Signal–receiver interactions may be studied at any level from the neurophysiological to the psychological, but the same underlying selection pressures must always be taken into consideration: the signal is designed to influence the behaviour of the receiving individual in the interests of the signaller, the receiver is designed to respond to its own best interests. Sometimes, perhaps always (see Zahavi, this symposium), these interests are in conflict.

The Discussion Meeting was organized around two aspects of design which we called ‘The structure of signalling systems’ and ‘The content of signals’ (following Guilford & Dawkins *Anim. Behav.* **42**, 1–14 (1991)). The intended distinction is between the adaptations that enable signals to be transmitted, received and processed efficiently in the prevailing physical and biological conditions, and the information that the signal is intended to convey or the manipulation it is intended to achieve. This distinction may not always be clear-cut and certainly several individual contributions cross the boundary, which is entirely appropriate.

Other connecting themes emerged during the Meeting. For example, the physical environment can influence signals in much more subtle ways than simply determining the requirements for maximum propagation efficiency (Römer, Ryan & Rand, Endler). Signals are often subject to conflicting selection pressures: because of the need to transmit more than one message (Vane-Wright & Boppré), because of other conspecific receivers (McGregor), or because of predators (Endler). Some questions remain controversial, such as the distinction between ‘honest’ and ‘conventional’ signals (Zahavi, Grafen & Johnstone, Dawkins), or the issue of whether receiver recognition system characteristics tend to inhibit or promote evolutionary change (Arak & Enquist) and several papers in this volume offer stimulating new approaches to this question. The nature of species recognition signals involves both of these issues: are they conventional signals, and are they resistant to evolutionary change (Löfstedt, Howard & Gregory, Vane-Wright & Boppré)? The value of phylogenetic inference in addressing some of these problems was also a repeated theme (Löfstedt, Ryan & Rand, Vane-Wright & Boppré).

We hope that the Discussion Meeting and this collection of papers will help to stimulate research in these areas in a more unified conceptual framework of signalling theory. We are indebted to the authors for their excellent contributions, to Miss C. A. Johnson for her invaluable assistance in the organization of the Meeting, and to the Royal Society Editorial Staff for their skill and efficiency in the production of this volume.

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