

himself and Lorenz on the one hand and the critics of ethology such as Robert Hinde on the other. Even though Tinbergen continued to stress Lorenz's position as the field's founder, Lorenz felt abandoned by Tinbergen and wrote him an angry letter. Tinbergen's response, which he prefaced by saying to Lorenz 'this is the most serious letter I have ever written to you', exemplifies his patience and love for Lorenz, carefully explaining how the new developments had come about; reminding him of the important differences between German and British attitudes; and sympathizing with him: 'You must not let yourself be worn down by the resistance we meet, it's part of our job as missionaries. But we each do it in our own way, and while you may disagree with my tactics, you must not doubt my integrity and sense of fairness to you. I too have to carry the burden of missionary, and by God I have to fight on many fronts too' (page 443).

It is easy to see Tinbergen as the good guy and Lorenz as the bad guy in this intellectual partnership. After all Tinbergen defined the field of animal behaviour with his four questions and his shift from studies of causation to the adaptive significance of behaviour provided the foundations for what became behavioural ecology. But we should not abandon Lorenz. His style of studying the animals he hand reared at home may now seem rather quaint, but this approach gave him unparalleled insight into their behaviour and in particular to individual differences in behaviour. In these days of institutionalized, competitive science, it is easy to forget that we still have much to learn about behaviour, and in my view much to learn from precisely the kind of approach at which Lorenz excelled. Behavioural ecology's *raison d'être* was to study individual differences, yet somehow researchers have largely failed to do this. As Tinbergen (but not Lorenz) realized, progress in science relies on change, and sometimes necessitates abandoning what went before. We may have dumped Lorenz's concepts such as the fixed action pattern, but it would be foolish to dump his genius for looking at behaviour. There are lessons to be learnt from *Patterns of Behavior* and one of these is that we sometimes find new potential in old ideas or approaches. Ignore history at your peril.

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*Animal Communication Networks*. Edited by Peter McGregor. Cambridge: Cambridge University Press (2005), Pp. xiv + 657. Price £75.00.

The classical view of communication involves two parties, the signaller and the receiver, and research has often

sought to understand the way communication systems evolve within this dyadic paradigm. However, in nature it is almost always the case that there are other parties within the active space of a signal that are also able to receive the information. This reception can have fitness consequences for the signaller, the receiver and the other parties, and thus affect the evolution of communication. Therefore, a full understanding of signal evolution necessitates accounting for the perspective of an animal living within a 'communication network' of conspecifics. Such argument is the starting point for this important new collection of work that reframes and re-evaluates much of our knowledge and current research from a 'networks perspective'.

There are 26 chapters in four sections, loosely although not altogether convincingly, grouped into four sections. Three deal, respectively, with behaviours considered specific to a network context (for example, eavesdropping), contexts in which a network perspective might deepen understanding (for example, begging) and taxon-specific communication networks from crabs to humans. The fourth is titled 'Interfaces with other disciplines' but is not as interdisciplinary as it sounds, containing chapters that illustrate how other areas of biology, from endocrinology to the evolution of altruism, can profit from a 'network perspective'. There is a high variance in the level at which authors have engaged with this concept. In ascending order of satisfaction derived, some chapters are largely reviews with a cursory discussion of networks (e.g. chapters 14, 21), while others collate and/or present data from a network perspective (e.g. chapters 10, 15, 22); a small proportion also engage at a conceptual level, discussing what we should term a communication network as distinct from social or information networks and which behaviours should be considered within this perspective (e.g. chapters 9, 23).

First the good news: it is clear from the material presented here that the editor is right to claim that 'the future is a network view of communication': an oversimplified dyadic perspective will clearly no longer do as we seek to deepen understanding of how, what and why animals communicate. There are several high-quality contributions demonstrating this. Kazem & Aureli provide a thoughtful analysis of redirected aggression in conflict losers, showing how several features typical of redirected aggression are better understood from a network perspective (chapter 10). Grafe shows how network interactions govern the characteristics of anuran chorusing (chapter 13). Burt & Vehrencamp's detailed analysis of dawn chorusing recorded with an array of microphones is the highlight of the book for me, showing how new techniques can improve the power of our observational data and illustrating how dawn chorusing is actually composed, at least in banded wrens, of a continuous series of interactions within a territory network. Hurst (chapter 11) and Johnston (chapter 16) contribute overlapping chapters that none the less show nicely how scent marking in mice and hamsters, respectively, builds over time into a communication network from which individuals can extract information regarding dominance relations and territory ownership. I also enjoyed Locke's

thought-provoking historical perspective on the role of human eavesdropping in social control (chapter 19). Finally, the potential power of the network approach is vividly illustrated in Bshary & D'Souza's elegant studies of cleaner fish/client interactions showing how image scoring may be operating in the evolution of behaviour, and providing exciting insights into its potential role in explaining apparent altruism. I noted that many of these studies are based on observations in nature; the difficulty of reproducing realistic networks in the laboratory suggests that the effective study of networks demands that observational studies of behaviour in nature be revalued.

However, some aspects of the book were less satisfying. One can argue that much of the material here is concerned with behaviour rather than communication per se. The concept of 'communication network' here seems to incorporate what might better be termed 'social networks' (e.g. chapters 24, 25) or 'information networks' (e.g. chapter 23). Some authors to their credit take on this conceptual work (e.g. chapters 9, 23) but the overall impression is of a net cast too wide for the specificity of the title and this volume might have been more appropriately titled 'Networks in animal behaviour'. It seems to me that the important word is 'network', and whether that network is informative, social or communicative is largely irrelevant to appreciating the power of studying animal behaviour from a network perspective. More conceptual work is needed on issues such as whether we should restrict 'communication network' to cases where signals have evolved in structure or usage to produce responses in a network of other individuals. Wisenden & Stacey give the most thoughtful contribution in discussing the ontology of communication networks (chapter 23).

There seem to be some holes in the treatment. Most strikingly, alarm calling (e.g. Zuberbühler 2001; Gill & Sealy 2003; Rainey et al. 2004) appears only fleetingly here (see chapter 17), despite being behaviour that makes no sense at all without a consideration of the network context in which it occurs. The network potential of echolocation is underrepresented, meriting only a brief mention in chapter 2 where it is classified as not 'true' eavesdropping because 'the sounds are not designed to transmit information to others'. This argument seems odd given the definition of eavesdropping adopted ('the use of information in signals by individuals other than the primary target') which seems perfectly apt for listening in on echolocation when the primary target is the emitting animal. These omissions are disappointing given that in other areas there is a great deal of overlap between chapters (e.g. chapters 1, 2, 14, 15, or chapters 11, 16) such that this volume need not really have been as weighty as it is.

Despite these shortcomings leaving the book less satisfying than I feel it could have been, it is none the less a landmark contribution towards a full understanding of animal communication. It is clear enough to be accessible to the undergraduate yet novel enough to be of interest to most animal behaviour researchers. This is obviously a starting point, given some of the outstanding issues above, but as such the volume is exciting for the roadmap of future research that it provides. Our understanding of

animal behaviour in networks, and how networks influence the course of evolution, is really in its infancy. This book is to be welcomed for the boldness with which it pushes us towards a maturing of the network perspective.

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*Nature's Music. The Science of Birdsong*. Edited by PETER MARLER & HANS SLABBEKOORN. San Diego, California: Elsevier (2004). Pp. viii + 513, 2 CDs. Price £49.95.

Marler and Slabbekoorn instigated this beautifully illustrated book as a tribute to Luis Baptista, who sadly passed away in June 2000. People who knew Luis Baptista well told me that he was, among many other things, a brilliant and enthusiastic science communicator. This volume would certainly have pleased him. The book contains 14 chapters of which 10 provide a thorough review of a specific aspect of birdsong science. These chapters' subjects range from a splendidly comprehensive review of the function of song in sexual selection by Sarah Collins, to a detailed description of the mechanics of birdsong production by, of course, Roderick Suthers. The integrated consideration of Tinbergen's four questions, as here presented in one volume, has now definitely found its way back into the study of behaviour. Nevertheless, this volume may be somewhat biased towards the 'how' question since four of the chapters focus on mechanisms and only one on the evolutionary approach. In addition to the familiar four questions, the subjects of the remaining chapters consider the history of birdsong science, the use of acoustic signals in conservation, the use of learned human signals by Alex the grey parrot, and a chapter on the relation between birdsong and music.

Until recently, books on birdsong had to rely on an onomatopoeic description of the sounds in combination with spectrograms, which could never do justice to the versatility of birdsong. This book is supplemented with two CDs that contain recordings of nearly all the sounds that are discussed in the book. It is quite a different experience and definitely more convincing to hear a European starling saying the words 'Hey Rex, c'mon' than seeing