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Introduction

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Author for correspondence:

Denis Noble
e-mail: denis.noble@dpag.ox.ac.uk

New trends in evolutionary biology: biological, philosophical and social science perspectives

Patrick Bateson¹, Nancy Cartwright², John Dupré³, Kevin Laland⁴
and Denis Noble⁵

¹Department of Zoology, University of Cambridge, Downing Street, Cambridge CB2 3EJ, UK

²Department of Philosophy, Durham University, 50 Old Elvet, Durham DH13HN, UK

³Egenis, The Centre for the Study of Life Sciences, Byrne House, St German's Road, University of Exeter, Exeter EX4 4PJ, UK

⁴Centre for Biological Diversity, School of Biology, University of St Andrews, Harold Mitchell Building, St Andrews, Fife KY16 9TH, UK

⁵Department of Physiology, Anatomy and Genetics, University of Oxford, Parks Road, Oxford OX1 3PT, UK

PB, 0000-0002-2920-3886; JD, 0000-0002-7451-2127; KL, 0000-0002-2457-0900

1. Introduction

This issue of *Interface Focus* publishes articles based on presentations to a joint Discussion Meeting of the British Academy and the Royal Society held at Carlton House Terrace on 7–9 November 2016.

Why was it a *joint* meeting? The reason is that both sides have much to offer and much to learn from each other in understanding the new trends discussed at the meeting and what their implications are.

With regard to the influence of the Royal Society side on the British Academy side, there cannot be much doubt that biological ideas on evolution have greatly influenced the social sciences and philosophy. Equally, with regard to the influence of the British Academy side on the Royal Society side, scientific controversies of the complexity and importance of the present one include not merely questions of scientific fact, but a range of conceptual and analytic issues that are central concerns of humanists and social scientists, especially, though not exclusively, philosophers of science. The organizers proposed the joint meeting because they believe that both sides clearly have a lot to gain from talking with each other. Ultimately our knowledge must be consistent across all the natural and social sciences. So understanding new results and new conceptualizations on both sides should be both a check and a spur for developments on each. And contemporary philosophy of science can be particularly helpful because of its focus on methodology across the natural and social sciences and on the integration of knowledge.

The organizers view this meeting as a positive opportunity to illustrate to those in the arts and humanities how evolutionary biology is a healthy, vibrant field, and that aspects of evolutionary studies that are not currently included in the textbooks are relevant to their interests. At the same time, a fundamental premise of the meeting is that philosophers and social scientists possess relevant expertise from which we can all learn, and hence that knowledge exchange should be bidirectional. It was agreed from the outset that approximately half of the speakers would be nominated by each academy. That balance between conceptual and empirical topics is reflected in the proportions of the articles published in this issue of the journal. Many of the articles address both kinds of question.

Moreover, this kind of discussion between the humanities and the natural and social sciences returns us to the original spirit of the Royal Society's longest-running journal, the *Philosophical Transactions*. Originally, that was not divided into A and B sides. Nor did it exclude logic and philosophy. If you doubt that, spend some time amongst the earliest *Philosophical Transactions* volumes in the library, and recall also that the Royal Society nearly became the publisher of one of the great works of the philosopher, Benedict de Spinoza.

The Society still treasures in its archives his Latin letters to the first secretary of the Society, Henry Oldenburg.

More recently, the Royal Society has re-established the cross-disciplinary principle of the early *Philosophical Transactions* with its new journals *Interface* and *Interface Focus*. Since we are a focused meeting, it is natural that the articles resulting from the meeting should appear in *Interface Focus*.

The meeting itself generated very lively and courteous discussion from an audience of nearly 300 from all over the world, many of them quite as distinguished as the speakers. The spirit of the discussions and round tables echoed the Royal Society's Latin motto NULLIUS IN VERBA. Roughly translated this can be taken to mean 'don't take anyone's word for it'. Examine the evidence, do not just quote authorities, however eminent. But note that that evidence can be of various kinds: semantic, logical, mathematical and experimental. Their roles in contributing to our knowledge are not the same and they are, ideally, complementary to each other. The articles in this issue of the journal illustrate all these forms of evidence.

The scientists and philosophers who have developed biological thought over the last two centuries have been among the best and most original minds of the nineteenth and twentieth centuries, all the way through Lamarck, Darwin, Weismann, Wallace, T. H. Huxley, Fisher, Haldane, J. S. Huxley, Waddington, Hamilton, McClintock, Price, Woese, Margulis and many others. Many of these were influenced by philosophers. For example, Waddington was strongly influenced by the process philosophy of Alfred North Whitehead.

But let us also remember that no scientific, mathematical or philosophical advance occurs simply by quoting authority. In the end, evidence is what counts. Remember also the philosophical insight that evidence is *evidence* precisely because it can be so interpreted. We all work, explicitly or implicitly, from or within metaphysical assumptions. That is so whether or not we recognize it. Moreover, different assumptions dominate alternative academic fields, which can lead to differences in interpretation, and to different emphases between individuals and field on what is causally relevant. For instance, some positions regarded as extreme within evolutionary genetics are seen as mainstream in other fields. That, ultimately, is what justifies a joint meeting of the kind we organized.

Evolutionary biology is a vigorous field of science with many new trends, not all of which can be covered comprehensively in a single meeting. Given the goals of the meeting, it was natural for the organizers to focus on those new developments that seem of most immediate mutual interest to researchers in both academies. That there happens to be a confluence between those topics of interest to the British Academy side and those emphasized by researchers pushing for an expanded conceptualization of evolutionary biology is no coincidence, as that common interest in part motivated the meeting. There are, in fact, very good reasons why topics such as the role of development in evolution, or the nature of heredity, should matter to social scientists, philosophers and developmental biologists, and these are among the subjects of the articles published here. Of course, a more conventional evolutionary biology meeting would likely choose other foci, but there have been no shortage of such meetings. The unusual context of the meeting also helps to explain why there should be a greater emphasis on conceptual issues, and fewer straight data papers, than might be typical of an exclusively biological meeting.

We anticipated that some speakers would reflect on, and perhaps even question, the adequacy of the neo-Darwinian synthesis, but this does not go beyond the fundamental right of any researcher to explore the assumptions that lie at the heart of their field and to propose constructive new ways of understanding. We take such discussion to be a healthy feature of any academic discipline. Recall too that the meeting was announced as a Discussion Meeting. In practice, there was a great deal of discussion about standard neo-Darwinian processes, but much of the discussion also centred around whether additional processes are also causally relevant and on the different manner in which these developments are handled in different fields. A wide spectrum of views is presented, with researchers adopting both newer and more orthodox positions invited by the two academies. While differences of opinion, and scientific discussion, are a normal feature of any science, we encouraged all participants to engage in such discussion in a calm, constructive and respectful manner. That is what happened at the meeting itself and is also true of the articles here that resulted from it.

Finally, no one, least of all the organizers, would wish to claim that we constructed the only possible programme for such a meeting. Many other eminent and innovative speakers could have been included if we had had the time and space to do so. We worked within the constraints of a 3-day meeting and the various balances that were required to ensure worthwhile discussion. Some areas are controversial and we have tried to respect that. The programme of the meeting and the articles here contain some very original scientists and thinkers.

The articles in this issue of the journal have been arranged into the following sections, but we should emphasize that the boundaries between the sections are fluid. Many of the articles refer to processes, and to conceptual issues as well as experimental findings.

We wish to dedicate this issue of the journal to the memory of Sir Patrick Bateson FRS. Patrick passed away just as the issue of the journal was finally ready for publication. As a co-organizer of the meeting that gave rise to the articles published here, he played an essential role at all stages of the organization and publication. He will be sorely missed not only by all of us, but also by his many colleagues and admirers across the world.

The extended synthesis, for and against

Gerd Müller: Why an extended evolutionary synthesis is necessary [1].

Douglas Futuyma: Contemporary evolutionary biology and the call for an extended synthesis [2].

Processes

Sonia Sultan, Developmental plasticity: re-conceiving the genotype [3].

Kevin Laland, John Odling-Smee, John Endler: Niche construction, sources of selection and trait coevolution [4].

Karola Stotz: Why developmental niche construction is not selective niche construction: and why it matters [5].

James Shapiro: Biological action in Read–Write genome evolution [6].

Eva Jablonka: The evolutionary implications of epigenetic inheritance [7].

Paul Griffiths: Genetic, epigenetic and exogenetic information in development and evolution [8].

Greg Hurst: Extended genomes: symbiosis and evolution [9].

Melinda Zeder: Domestication as a model system for the extended evolutionary synthesis [10].

Andrew Whiten: A second inheritance system: the extension of biology through culture [11].

Conceptual perspectives

Denis Noble: Evolution viewed from physics, physiology and medicine [12].

John Dupré: The metaphysics of evolution [13].

Peter Godfrey-Smith: The subject as cause and effect of evolution [14].

Patrick Bateson: Adaptability and evolution [15].

Andy Gardner: The purpose of adaptation [16].

Human evolution

Tim Lewens: Human nature, human culture: the case of cultural evolution [17].

Augustin Fuentes: Human niche, human behaviour, human nature [18].

Susan Anton: Early *Homo*, plasticity and the extended evolutionary synthesis [19].

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