Permanent revolution

To defend evolution against misguided attacks, we need to consider how evolutionary biology is perceived by outsiders.

Attacks on evolution are sadly commonplace, and of themselves hardly worth the attention of an Editorial in this journal. However, the fact that the attacks come from a diverse range of sources is indicative of the cultural divide that can separate scientists from both popular culture and other branches of intellectual opinion. Two recent threats illustrate this point.

The news that Turkey has removed evolution from its school curriculum is depressing but unsurprising. The friction between evolutionary biology and fundamentalist versions of all the Abrahamic faiths is a constant irritant, and new manifestations of it have all to do with the political balance between moderates and extremists, and little to do with any developments in either science or religion. The global situation is made worse by the considerable financial clout of the creationist lobby in the United States, whose international reach has been recently demonstrated by the funding of an Intelligent Design institute in Brazil¹. The best that scientists can do is continue to reach out beyond their academic bubble, using all media available to them, and engage patiently with those legislators, religious moderates and members of the public who will listen. The EvoKE team, whom we interviewed recently, is an admirable example of this².

A quite different threat to evolutionary biology comes from elements in the non-scientific intelligentsia. It is important to note that some of the greatest friends of evolution belong in this category, and that it is a small minority whose attitude to evolution is problematic. The latest concern is a new biography of Darwin by the contrarian British writer A. N. Wilson³. The main premise of the book is that Darwin's ideas on evolution were largely an attempt to justify the position of the wealthy industrial bourgeoisie in Victorian Britain. Along the way, it is claimed that many of Darwin's ideas have since been discredited and much of his theory superseded. We should distinguish carefully between illegitimate attacks on evolution and legitimate criticisms of Darwin the man. However, Wilson's argument crosses the line between the two, and it is good that it has been tackled head-on in reviews of the book^{4,5}.

Another example of an attack from intellectual quarters is the 2010 book *What Darwin Got Wrong* by Fodor and Piattelli-Palmarini⁶. These authors state explicitly that they are not arguing from a religious point of view, but suggest that the many non-selective explanations for biological phenomena and the supposed philosophical contradiction at the heart of evolution undermine evolutionary biology. One source of their arguments is the renowned philosopher of science, Karl Popper, who at one point disputed the falsifiability of natural selection (a position from which he later backtracked). The issue may well have just as much to do with shortcomings of Popper's view of how science works as with problems with evolutionary theory.

A key influence on Fodor and Piattelli-Palmarini, as well as on other intellectual doubters of evolution, is the entirely legitimate debate that the evolutionary biology community has been having for decades on the influence of selection compared with other forces. This debate has taken many forms and is far too varied to recount here. It is an important debate from not only a basic science point of view, but also for applied questions such as how we interpret medical genetic and behavioural data. However, it is also a gift to 'deliberate misunderstanders' of evolution, be they secular intellectuals or religious fundamentalists. These people delight in treating non-scientific worldviews as being intellectually equivalent to different interpretations of the same scientific data sets. A recurrent issue for evolutionary biologists is therefore how we explain our disagreements to outsiders.

One approach is simply to provide as much information as possible. By this, we mean an ongoing popular commentary on the mini-revolutions that are happening all the time in evolutionary biology; these may not be the revolutions of Kuhnian proportions that get the critics excited, but they show that the field is in a state of permanent revolution that does not threaten its fundamental underpinnings. A glance through the table of contents of any evolutionary biology journal should make this clear, and this issue of *Nature Ecology & Evolution* is no exception.

For example, the Cambrian Explosion of animal life has been a well-established fact. However, recent research such as that by Parry et al. (and News and Views by Tarhan) is creating a more nuanced view of this event, with much of the action shifting to the Ediacaran or even beforehand. The Perspective by Haslam et al. describes recent advances in primate archaeology, a field that has caused another quiet revolution by showing that tool use is not a behaviour that sets hominins apart from other species. Other challenges to received wisdom in this issue include Steinmetz et al. (plus News and Views by Hashimshony) showing molecular evidence that three germ layers exist in non-bilaterians that have only two visible germ layers; the demonstration by Walter et al. that Lyme disease has been present in North America for thousands of years longer than humans have and that the outbreak that has been going on since the 1970s is not the result of recent evolution; the Devonian tetrapod-like fish from Zhu et al. that revises our understanding of stem tetrapod phylogeny; and the finding by York and Davies (and News and Views by Liang) that female cuckoo calls have a role in host deception.

If we can get across to those outside evolutionary biology and outside science that such revisions of our understanding are the usual nature of research, through both school teaching and public outreach, we might be less misunderstood when we argue in public about something even more substantial. To cite one final example from this issue, the study of human epigenetic variation by Carja et al., we can even hope that we might be able to have a serious conversation about what epigenetics might, or very well might not, mean for evolution, without the critics descending like a flock of vultures. □

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References

1. Machado Silva, H. *Science* **357**, 880 (2017).
2. Domingues, V. *Nat. Ecol. Evol.* **1**, 0143 (2017).
3. Wilson, A. N. *Charles Darwin: Victorian Mythmaker* (John Murray, London, 2017).
4. Hughes, K. Charles Darwin by AN Wilson review – how wrong can a biography be? *The Guardian* (30 August 2017).
5. van Wyhe, J. 'Radical' new biography of Darwin is unreliable and inaccurate. *New Scientist* (21 August 2017).
6. Fodor, J. & Piattelli-Palmarini, M. *What Darwin Got Wrong* (Profile Books, London, 2010).