A Remarkable Journey: The Story of Evolution

R. PAUL THOMPSON

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Charles Darwin opened the first edition of *On the Origin of Species* with two quotations. In the first, as Elliot Sober (2008, 110) points out, Darwin appropriated the idea from William Whewell that 'the unified hypothesis is superior to the disunified hypothesis'. Thus, according to Sober, Darwin argues that his theory is superior to that of 'the independent creation of each being'. In the second quotation, Darwin refers to Francis Bacon to make clear that 'there is no conflict between theism and the theory of evolution. ... evolution is God's way of making organisms'. Thus, Darwin gives his answer to two fundamental questions. The first is what criteria we should apply to prefer one theory to another. The second is whether accepting the theory of evolution entails the rejection of theism. Even though these two questions seem only loosely related, they have been intimately connected ever since Darwin.

In R. Paul Thompson's *A Remarkable Journey*, these two themes play an important role. A vivid history of evolutionary theory, it explains how key advances in evolutionary biology have increased the power of evolutionary explanations over the last two centuries. The book is intended for a lay audience, and aims to 'explore the theoretical facets [of evolutionary theory], those that transformed the theory at various points' (10). Continuing, Thompson promises that 'along the way, we will glance at the social and political implications as well as the technologies it [evolutionary theory] has spawned'.

In chapter 1, Thompson sketches the scientific landscape in the UK and Germany before the publication of *Origin of Species.* In chapter 2, Darwin's main arguments in favour of his theory are presented. Thompson also details which elements were missing from the argument: a solid idea of how heritability and variation are realized. These elements are examined in chapter 3, along with attempts to fill in these gaps from Darwin's time to the end of the 19th century. Chapter 4 discusses the missing piece on heredity: Mendel's experiments and his theory. Subsequently, Thompson details how Mendel's findings did not settle the issue, but opened up a vivid debate between 'Mendelians' and 'biometricians'. Chapter 5 treats this controversy in detail. In the 1920s, much of this controversy was laid to rest by J. B. S. Haldane, R. A. Fisher, and Sewall Wright: chapter 6 explains how this was done, with an emphasis on Fisher's work.

Then, the book changes focus. Thompson asserts that 'evolutionary biology now

had a robust formal theory' and that 'working out the implications of the theory for understanding biological phenomena was essential' (135). In chapter 7, Thompson details these implications through a story of how the Modern Synthesis was constructed. Chapter 8 details the discovery of DNA and key advances in the molecular basis of heredity that followed. In chapter 9, Thompson describes findings on the evolution of behaviour and the limits of this approach. In chapter 10, the importance of development in understanding actualized organisms is highlighted. Finally, in chapter 11, Thompson describes how and why biblical literalists reject evolutionary theory and attempts to show why they are wrong.

The common theme that runs through these chapters is how scientists construct their theories and how they test them. Most of the examples come from evolutionary biology. Sometimes Thompson reverts to physics to illustrate theoretical points regarding philosophy of science. The book is a wonderful balancing act between the theoretical questions that preoccupied practitioners and the context in which these questions were studied. Thompson also makes clear how a number of factors need to be in line for a theory to be successful: the theoretical framework, key assumptions, and the experimental model.

In many instances, a particular idea was (almost) discovered several times over. Francis Galton came close to Mendel's laws, but by relying on an idea of heredity composed by continuous traits rather than discrete ones, as Mendel did, Thompson states that Galton merely 'veered in the direction' (68). A discovery, then, arises because of a combination of all the good ingredients. Mendel was 'an insightful genius' (81) but also plain lucky to pick the right combination of research question (what frequencies of a particular trait to expect in the next generation), theoretical assumptions (heredity is discrete), and model system (the particular traits in *Pisum,* in which heredity is actually discrete). In this context, the near-discovery (by Galton) or re-discovery (by De Vries, Correns, Von Tschermak. and Spillman) of Mendel's laws becomes a case study of both this serendipity and the apparent inevitability of certain ideas.

Maybe this is why I most enjoyed chapters 3 and 5, that describe periods in which multiple theories on certain aspects of evolutionary theory existed at the same time and their proponents engaged in furious debates as to who was 'right'. These chapters directly address our first question, how do scientists test the success of their theories? Especially in the early stages of developing an explanation for a particular phenomenon, a theory might not be complete and leave out or be incompatible with important observations. As a theory gets more attention, these 'missing pieces' may eventually be filled in—or not. The history of evolutionary biology abounds with theories that failed to live up to their expectations, that did not manage to accommodate important new insights or that simply went out of fashion. Thompson names quite a few

of these, and all key actors in his *A Remarkable Journey* have at some point held views that would now be considered obsolete.

Disappointingly, instead of directly addressing the first question of how success is assessed, Thompson often slips into a judgemental commentary. For example, in chapter 3 he writes, 'as our story unfolds, it will become clear he [William Bateson] was on the wrong side' (49). The context is the debate on the role of natural selection, in which Bateson as a Mendelian disagreed with 'Darwin's view that it could act on small individual variations' (76). Yet to what extend was Bateson 'on the wrong side'? We now know that large variations and even speciation can occur quite suddenly, under circumstances that are not covered by Fisher's and Haldane's models. These models, according to Thompson, were supposed to have 'clinched the entire matter' (124). Thompson could have included findings from developmental biology in chapter 10, namely that some small mutations can lead to phenotypic changes with large fitness effects. The relative importance of these different modes of evolution is a question biologists still do not agree about and has even led some to call for an 'extended synthesis'. In recent years, Bateson has often been hailed as a visionary (see for example Schwartz 2007).

The transformation of evolutionary theory that Thompson writes about is also a story of the road not taken. Even though the intended audience is the interested lay person, it is a pity that Thompson spends whole pages explaining theory in philosophy of science through analogies with examples from physics, but very little time detailing how and why a particular theory in evolutionary biology became accepted or not. The snippets of philosophy of science with which Thompson intersperses his text are very illuminating and make clear how hard it is to judge a theory, for example when he compares the arguments in favour of evolutionary theory between Darwin's first and later versions (chapter 2, figures 6 and 9). Yet on page 153 he states that 'evolutionary biology now had a robust formal theory'. What more can be said about criteria such as robustness? How do we measure these criteria, and how do we rank them?

In the final chapter, Thompson brings up our second question of whether accepting the 'unassailable pillar of the edifice of modern science' (10) entails the rejection of theism. Thompson speaks of the 'truth' of evolutionary theory and states that 'the fact of evolution is indubitable' (190). He contrasts this with the 'political cacophony' (194) of continuing objections by 'biblical literalists', whom he equates with the intelligent design movement as no more than a 'recent attempt to reinvigorate the biblical literalist view' (195). There are a number of arguments to counter creationist and literalist stances on the validity of evolutionary theory and, as Thompson rightly states, most theists actually adopt a compatibilist stance.

However, after all the history and philosophy of science to which Thompson

treats his reader, he still asserts that 'one can take some comfort in the fact that, at every turn, science, including evolutionary science, is advancing' (198). This advance can be measured only in terms of its success. As we have seen, success is hard to define, and sometimes it means we have to backtrack and consider another theory, even one that we have already rejected. Haldane 'saw no reason why one could not hold two conflicting views simultaneously' (56–57). This might seem contradictory. Yet if we have two or more different standards for evaluation of success, it becomes perfectly possible to hold two or more conflicting views. A major role for philosophy of science should be to evaluate those standards: multiple views might be right, or wrong, in different contexts.

It is exactly this seeming contradiction in scientific arguments that intelligent design and biblical literalists thrive on. It seems to me that explaining this contradiction as a symptom of 'science in progress' would be an enormous advance, since this lack of understanding on how science works is at the core of many public debates on the validity of research. For this reason it is a pity that Thompson considers Haldane merely 'unusual' (56). A more explicit treatment of this contradiction would have made *A Remarkable Journey* a better book.

References

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