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BOOK REVIEW

"There is Grandeur in this View of Life…."

The Origin Then and Now: An Interpretive Guide to the Origin of Species, by David N. Reznick Princeton: Princeton University Press, 2010. pp. xvi + 432. H/b $29.95

George E. Webb

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During the centuries between the fall of Rome and the beginnings of the European Renaissance, much of the scientific work associated with ancient Greece and Rome disappeared from the European view. Significant contributions to science and medicine migrated instead to the Arab world, where numerous scholars not only preserved this material but added greatly to it. Grafting their own research to the stems passed from Greece and Rome, Arab scholars created a body of knowledge that was re-introduced into Western Europe as a result of the Islamic expansion across North Africa into Spain at the end of the First Millennium. These materials found interested readers during the early years of the Renaissance, serving as the core documents in the process of translation and study that characterized the humanistic revival of the time. An excellent example of this process is the recovery of the work of the noted Greek astronomer Ptolemy, whose major contribution is known by its Arabic title, *Almagest*.

The documents that passed into the West through this circuitous route often came in the form of "commentaries" on the original works. The commentary tradition allowed Arab scholars to integrate later knowledge into the existing Greek and Roman corpus, providing their readers with intriguing perspectives and new information. This tradition was adopted by many European scholars of the Renaissance, who began to recognize the cumulative nature of knowledge, an awareness particularly dramatic among those who pursued what later became known as science. Recognizing that the ancients had much knowledge of value, western scholars increasingly added to this base, often using the commentary form as their vehicle. This practice is dramatically shown by the work of Copernicus, whose *De Revolutionibus* is in large measure a closely crafted commentary on Ptolemy's *Almagest*.

In many respects, biologist David N. Reznick has adopted the commentary form to provide modern readers with a new introduction to Charles Darwin's *Origin of Species*. Many who have actually read Darwin's most famous publication have been struck by the elegance of his prose and the carefully crafted organization of his "one long argument." As Reznick points out, however, the changes in our understanding of evolutionary processes over the 150 years since the publication of *Origin* have turned Darwin's volume into a less usable discussion of the topic. The lack of knowledge concerning the mechanism behind the variations on which natural selection acted, as a particularly dramatic example, led Darwin to various speculations during the several editions of the book, most of which strike the modern reader as both forced and disappointing. Paleontologists have added innumerable specimens to the fossil record, eliminating yet another troublesome aspect of Darwin's original explanation. Zoologists and botanists continue to add to the catalogues of species as well, providing even greater support for Darwinian concepts. In short, the status and scope of organic evolution is so much larger and better understood than in Darwin's day that his 1859 publication takes on the appearance of an historical artifact. Employing the commentary tradition, Reznick attempts to recast *Origin* in a more contemporary and useful form, integrating both new ideas and new data. He accomplishes this goal in an admirable fashion.

G. E. Webb (✉)
History Department, Tennessee Tech University,
Cookeville, TN 38505, USA
e-mail: gwebb@tntech.edu

As the author explains in his preface, modern readers, whether scientists, students of the humanities, or interested laypersons, often have difficulties reading *Origin* for a wide variety of reasons. The sheer magnitude of the data Darwin presents is, at times, overwhelming. Because scientists have become more specialized since the mid-nineteenth century, Darwin's breadth of knowledge is no longer possible, erecting another barrier to the appreciation of *Origin*. A further difficulty for modern readers is the difference between the science of Darwin's day and the present. Perhaps most troubling is that Darwin had no fewer than four main themes for his book, which he addressed throughout his study, providing a challenge for most readers. Reznick, again following the commentary tradition, decided to deconstruct *Origin* and reformat it so that three of these themes are traced in the three main sections of his book. The fourth theme, an attempt to anticipate the debates that the evolutionary explanation would cause, is integrated throughout Reznick's volume. The author uses Darwin's organization of *Origin* as much as possible, even when pursuing the separate themes, and makes judicious use of quoted material from Darwin's volume.

The cleverness and effectiveness of the author's structural plan becomes clear from the beginning. Examining natural selection as the first theme, Reznick provides his readers with a wide variety of historical and scientific material to both clarify and expand Darwin's insight. He reveals the magnitude of the diverse data used by Darwin, explicates the arguments in *Origin* concerning natural selection, and shows how developments since the mid-nineteenth century have consistently reinforced Darwin's concept of evolution through natural selection. A separate chapter on the "struggle for existence" provides detailed discussion of how this phenomenon serves as the engine for natural selection and, thus, for evolution. Reznick also makes quite clear that, despite popular opinions and Darwin's own ambiguous perspective, natural selection and speciation are not the same and that natural selection is crucial for evolution within species as well. As he does throughout his book, Reznick closes the natural selection section with a chapter on modern evolutionary perspectives, in this case using his own research on guppies to show how evolution works in nature.

With natural selection firmly established in the reader's mind, Reznick next devotes his attention to the concept of speciation. Again displaying an excellent grasp of the historical context, he stresses that the definition of "species" in Darwin's day was quite different from the definition used by practicing scientists today. The author provides an excellent discussion of the Modern Synthesis and the new definition of species that came from that development in the 1930s and 1940s. Because Darwin's concept of species was so obviously different from the modern one, Reznick goes to great lengths to show that while Darwin's vision is, from the modern perspective, incorrect, his fundamental explanations and insights remain intact. In this chapter, the author makes excellent use of the famous branching diagram in *Origin* (the only illustration in Darwin's volume) to illustrate examples of how species evolve, how they become new species, and how they become extinct. Reznick's careful discussion guides the reader through the complexities of evolution in a very effective fashion. He also examines contemporary research using such techniques as DNA sequencing to reveal again how the most modern research continues to clarify and confirm most of Darwin's ideas. For his "Evolution Today" chapter in this section, Reznick provides a fascinating account of research from the 1990s concerning the rapid evolution of reproductive isolation between mosquitoes living in the London Underground tunnels and those living on the surface. Once again, he offers readers contemporary evidence to reinforce Darwin's earlier concepts.

Reznick devotes part three of his volume to a detailed discussion of how Darwinian evolution works as a theory. He begins with a very well-written chapter explaining to the reader exactly what "theory" means in the context of science. Despite contrary opinions expressed by supposedly well-educated individuals, he points out, "theory" and "guess" are not synonyms. The author stresses the crucial role played by observation and prediction in forming a legitimate theory, again attempting to show readers how science works. The remainder of part three, while maintaining its focus on evolution as a theoretical construct, follows Darwin's lead in attempting to anticipate challenges to the theory and to answer them. The discontinuities in the evolutionary record troubled Darwin greatly and led him to suggest that the incompleteness of the fossil record was an important part of the explanation for discontinuity. Other explanations offered in *Origin* included the rarity of speciation and the extinction of transitional varieties, both of which created an inaccurate record. Reznick discusses Darwin's explanations carefully while integrating the results of contemporary research (the greatly expanded fossil record, for example) to emphasize how well Darwinian concepts have stood the test of time. Adding to the value of this section of the volume are several chapters detailing how advances in geology have reinforced the foundation of Darwin's evolutionary edifice, as well as chapters discussing geography, classification, morphology, and embryology as sources of evidence supporting Darwin's ideas. Although Darwin used evidence from these fields in *Origin*, Reznick emphasizes how much

more complete this evidence is today. The science of genetics, for example, unknown in Darwin's day, is merely one of many recent developments serving to confirm Darwin's basic ideas.

The final chapter of *The Origin Then and Now* ("The Witness Has Been Found, Again and Again") serves as an excellent summary of Reznick's discussion and an effective restatement of several major points. He begins by stressing that Darwin's theory (as is the case with any legitimate scientific theory) was never seen as the final answer but was always viewed as a guide for future research. Reznick uses the word "challenge" to describe how scientists regard this theory (p. 402), a word that seems especially apt. He offers several examples of contemporary research that support Darwin's ideas, including a long discussion of the current state of evidence for human evolution (pp. 404–412), tackling a topic Darwin chose to avoid in *Origin*. He ends this chapter by commenting that the errors in Darwin's work were almost always a result of lack of knowledge on the part of the scientific community of his day and that, with the greatly expanded and more accurate knowledge of today, Darwin's basic ideas and insights remain sound, even if they have been modified over the decades since 1859.

The Origin Then and Now is a significant book of value to many diverse audiences. Practicing scientists in the life sciences will gain a greater appreciation for the centrality of evolution in biological studies, while those in the physical and other sciences will better understand evolution and its significance. Science teachers at every level not only will benefit from this better understanding of evolution itself but also will gain an equally valuable insight concerning the meaning of "theory" in science and its role as a guide for future research. With this knowledge, teachers will be better able to help their students to understand both evolution and the methods of science. Scholars in the humanities will also benefit from a close reading of this work. Blending as he does the historical and scientific contexts of evolutionary theory, Reznick provides a clear discussion of the details and the importance of the evolutionary debate. Many historical accounts of the evolution controversy exist, but they rarely include adequate discussions of the science involved and thus provide little insight to assist in evaluating the continuing antievolution perspective. This book will also provide humanities scholars with a better understanding of science and how science works, knowledge that is woefully and distressingly lacking among these individuals.

Because the evolution controversy remains newsworthy, perhaps the audience with the most to gain from Reznick's excellent volume is the interested layperson. This long-standing debate has, in the past few decades, been largely reduced to a collection of sound bites focusing on such terms as creation-science, intelligent design, and the like. Much more is involved. Reznick shows clearly the explanatory power of evolutionary theory, debunks the concept that "theory" and "guess" are synonymous, and subtly but effectively reveals the intellectual bankruptcy of the current generation of antievolutionists (whatever they call themselves). The author's closing paragraph is central to this contribution to the debate. He makes an effective, if not particularly original, parallel between the current evolution debates and Galileo's clash with the Church in the seventeenth century. Reznick closes his discussion by arguing that the Church feared that Copernicanism "would cause its followers to lose faith. Faith was not so fragile. Darwin's theory presents similar challenges. Faith will survive them as well" (pp. 414–415). We can hope that Reznick's admirable volume will convince his lay audience that not only is Darwin's theory one of the central concepts of science but that it must be included in any worthwhile science curriculum.