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*Charles Darwin, Geologist* by Sandra Herbert

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While the title of Sandra Herbert's scientific biography of Charles Darwin will generate no surprise among scholars of 19th century science, the audience for whom this volume is clearly intended, it will for those who still think of Darwin's primary achievement as 'biological'. It is worth noting, therefore, the opening lines of Charles Lyell's *Principles of Geology*, perhaps the single most important influence on Darwin during his formative, Beagle, years:

Geology is the science which investigates the successive changes that have taken place in the organic and inorganic kingdoms of nature; it enquires into the causes of these changes. . . . [Lyell, 1830-1833, 2.1]

That would help the surprised reader to see that the work for which Darwin is best known, *On the Origin of Species*—an investigation into the causes of the successive changes in organic nature—was a contribution to geology, at least as Lyell understood it. But those who contribute to, or follow, the 'Darwin Industry' learned that lesson long ago, thanks to the work of people like Jonathan Hodge, David Kohn, and Sandra Herbert in her earlier work.

The current book calls for a much greater reorientation and will do much to restore balance to Darwin studies. For what Herbert shows, with the loving attention to detail of a gifted scholar, is that Darwin would have stood shoulder to shoulder with Lyell as one of the giants of geology had his species project never seen the light of day. It is not until the last two chapters, after nearly 300 pages tracing Darwin's life as a geologist, that Herbert turns to the topic that is the center piece of virtually every other book on Charles Darwin, the 'Species Question'. Herbert thus quietly and gently makes the case

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that to see his geological work through the lens of his work on the species question inevitably distorts our image of both. Indeed, her conclusion is that Darwin's reputation as a geologist has been tainted by the success of a project that he and Lyell would have viewed as geological! History plays cruel tricks on us.

The title of her first chapter, which consists of the last three words of her concluding chapter, 'I a geologist', is lifted from an autobiographical note which Darwin penned in 1839 contrasting his form of imagination with that of others. The entire volume is fairly scattered with such quotations—a constant reminder that this study comes from the hand of one of the foremost editors of Darwin's heretofore unpublished notebooks, a gift to Darwin scholars that keeps on giving. One imagines that Herbert has much of this notebook material ordered in a mental filing system, ready to hand when it is needed. Even if you have studied the edited notebooks carefully and worked through Janet Browne's definitive two volume scientific biography of Darwin, this chapter will give you a feel for Darwin's day to day geological toils during the Beagle voyage that makes earlier studies pale in comparison. If recent work by Philip Sloan and others have urged upon us the importance of invertebrate zoology before, during, and after the Beagle years, Herbert reminds us that the geological mission was primary. This chapter and the next intertwine discussion of Darwin's fieldwork and theorizing in geology with a rich discussion of the context for his work.

The great strength of these chapters lies in the richness of the description of both theoretical geology and its empirical methods during the 1820s and '30s as Darwin would have experienced them. I found gratuitous references to Latour [e.g., 8, 31] off-putting, and thought that insufficient emphasis had been put on the *philosophical* impact on Darwin of Sir John Herschel's *Preliminary Discourse on the Study of Natural Philosophy* (a deficiency somewhat ameliorated in chapter 7) and volume 2 of Lyell's *Principles of Geology* (though again, Herbert has more to say on the topic in chapter 9). That being said, I left these first chapters with a better sense of the working life of Darwin the geologist—and of geology—in these years.

Chapter 3 recounts in detail the developing methods for specimen collection, measurement, labeling, describing, recording, and storing during the 19th century; and provides an extremely 'thick'

description of Darwin's mastering and applying those methods in his field work. While obviously relying on a painstaking study of Darwin's specimen notebooks and the remaining objects to be found in various museums, the narrative is not overwhelmed by the detail. There is a valuable lesson here for historians and philosophers of science. Darwin was a theoretician, and a brilliant one. But a notable feature of that brilliance lay in his powers of *integration*, of seeing the unifying thread in what might otherwise be an overwhelming mass of data. This chapter is a clarifying reminder of the painstaking work Darwin did collecting, ordering, describing, and studying the concrete objects about which he theorized. It becomes clear why he is inclined to call abstract generalizations 'large classes of fact'.

In his college years, Darwin was attracted to the writings of Alexander von Humboldt; and we are reminded of that in a too brief fourth chapter in which Herbert provides a lovely literary analysis of Darwin's published journal from the Beagle voyage. As she notes and illustrates, 'Darwin was artful in constructing narrative that emphasized the dramatic elements in landscape,' perhaps reflected in, or influenced by, his fondness for Wordsworth.

The next four chapters take us through the years during which Darwin was focused on writing up and publishing his increasingly systematic geological ideas. Once again, Herbert takes us into the details of how Darwin moved from the raw data of his field and specimen notes through a variety of stages, before beginning to prepare a manuscript for publication. Once again we are reminded of the amazing breadth and depth of Darwin's empirical base. In fact, I know of no other study of Darwin that provides such a rich picture of this side of his work. But Herbert also reminds us that he was willing to do what his teacher Sedgwick was not—interleave hypothetical explanations and theoretical interpretations in his field notes. Though the balance between theorizing and concrete description is reversed, the 'species notebooks' also reveal this aspect of Darwin's thinking, a desire to move back and forth between the concrete and abstract.

Chapter 6, 'Negotiating Genesis and Geology', is less groundbreaking, though certainly necessary for the narrative Herbert develops; and I take it the ground it covers will be obvious from the title, Darwin being one of the negotiators, of course. Chapters 7 and 8, however, are a fascinating study of the perils of theorizing, that drive

to find the grand unifying hypothesis which so easily leads an integrator like Darwin astray. Here Herbert notes a common theme in Darwin's two favorite college authors, Humboldt and Herschel, their stress on theoretical simplicity as an ideal. A careful analysis of his work on coral reefs and volcanic islands suggests that Darwin recognizes the dangers of overlooking problems in the search for that 'one great cause' which will explain a wide range of phenomena. The next chapter, 'Simplicity Challenged', gradually focuses in on the mistake which early on in his career taught Darwin that lesson in a most painful way, his faulty explanation for 'the parallel roads of Glen Roy', an explanation which in his family autobiography he called 'a great failure' that 'has been a good lesson to me never to trust in science to the principle of exclusion' (quoted by Herbert on page 285). She uses some tantalizing quotations from his later correspondence to suggest that this failure affected his attitude even to his beloved natural selection. In the second chapter, Herbert quoted a note from Darwin's soon-to-be bride Emma Wedgwood saying she hoped he would 'manage to finish Glen Roy now & get shut with it' [78]. This suggests a more prosaic reason for Darwin's rushing a poorly tested theory into print.

Only by comparison with the new insights that fill the early chapters is it true to say that the 'Species' chapters are less rewarding. Even here however, Herbert's stress on the importance of Darwin's strictly geological work to his developing theory of descent with modification by natural selection enriches our understanding of that development. Chapter 9, 'Geology and Species', closes, appropriately, by recounting the correspondence between Lyell and Herschel in early 1836 regarding 'that mystery of mysteries', the 'origination of fresh species' (Herschel's words). Four months after Herschel sent these words from Cape Town, South Africa, in praise of Lyell's willingness to put the problem on the geologist's table [in [Lyell 1830–1833](#), vol. 2], H.M.S. Beagle arrived in Cape Town on its way back to England with a young geologist on board newly converted to Lyell's vision of the subject. We know that Herschel and Darwin met more than once during this stopover. Did Herschel show Darwin a copy of his letter? A notebook entry two years later suggests not, though entries in the *Red Notebook*, edited for publication by Herbert herself, suggests otherwise. Did they discuss Lyell's *Principles*? Almost certainly. Did they discuss the question of species origination opened up by Lyell?

Neither of them ever say. Herbert says pretty much everything the evidence allows. These encounters remain a tantalizing enigma.

The last chapter is a substantive study of the development and presentation of the argument in *On the Origin of Species*. Here again we are on more familiar territory, but here again Herbert asks us to look more carefully at the role played by geology in the process of developing and presenting the argument. This provides her an opportunity, as one example, to focus on Darwin's disagreement with certain of his allies over whether evidence from geology should trump that from biogeography and classification in evaluating theories. Some of his allies were willing to essentially invent land bridges for which there was no geological evidence, in order to account for certain relationships among species on different continents. Darwin ('I a geologist') consistently sides with the geological evidence (or lack thereof).

*Charles Darwin, Geologist* is, besides being a enormously valuable addition to Darwin scholarship, a beautifully produced volume in which both the author and publishers should take great pride. One feature of the production in particular should be praised and emulated. There are a generous number of figures and plates throughout the volume. Rather than have them sequestered in bundles, as is so often the case, the editors have chosen to place the images precisely where they are being discussed, saving the reader the task of searching around for the appropriate illustration. The notes and bibliography are as rich in detail as the volume itself.

There is a lesson from this study that I doubt was intended by the author, a lesson that emerges when we place this study of Darwin in the context of the scholarship of the last 20 years or so. Darwin's achievements are too great (in both the descriptive and normative senses) to capture on one canvas. Herbert notes that Darwin essentially gives up field work in geology after his marriage and move to Down; and, thus, her volume focuses the vast majority of its pages on Darwin's early years. Yet those are the same years that have led Hodge, Kohn and Sloan to paint Darwin as a 'generation theorist', driven by a passion for understanding the multitude of ways in which the continuity in 'the coral of life' is reproduced. Neither of these images of Darwin takes into account the fact that after the *Origin*, during the last two decades of his life, Darwin became one of the world's leading botanists, displaying in volume after volume a subtle talent

for experimentation that few studies of Darwin emphasize. His modest, even self-deprecating, manner should not mislead us: he was a multifaceted genius to whom no one book can do full justice. *Charles Darwin, Geologist* illuminates in rich detail one of those facets.

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