

Charles Darwin's reputation: how it changed during the twentieth-century and how it may change again

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Charles Darwin died in 1882. During the twentieth century his reputation varied through time, as the scientific foundation of evolutionary theory changed. Beginning the century as an intellectual hero, he soon became a virtual footnote as experimental approaches to evolution began to develop. As the Modern Synthesis developed his reputation began to rise again until eventually he was identified as a founding father of the Modern Synthesis itself. In the meantime, developmental approaches to evolution began to challenge certain aspects of the Modern Synthesis. Synthesis authors attempted to refute the relevance of development by methodological arguments, some of them indirectly credited to Darwin. By the end of the century, molecular genetics had given new life to development approaches to evolution, now called *evo devo*. This must be seen as a refutation of the aforesaid methodological arguments of the Modern Synthesis advocates. By the way, we can also see now how the historiography that credited Darwin with the Synthesis was in error. In conclusion, one more historical revision is suggested.

Introduction

Charles Darwin's reputation in the scientific community has changed in interesting ways since his death in 1882. The reputation of Darwin's core doctrine of descent with modification – that species of organisms on earth have descended from common ancestors – has been constant. Resistance came from religious conservatives, but very little from within the scientific community. However Darwin's belief in the importance of natural selection as a uniquely important cause of most evolutionary change was a minority view until well into the twentieth century. Other important beliefs, such as the nature and meaning of heredity and development, have vacillated immensely through time. These changes have two aspects. One is whether or not Darwin's views are deemed to be correct (according to the best available knowledge). The other is, more subtly, what Darwin's beliefs actually were. Scientists and historians changed their views not only regarding the truth of Darwin's beliefs, but also regarding what those beliefs were. To complicate the story even further, the meaning of certain crucial concepts changed during the century, among them the terms 'heredity' and 'Darwinian'.

This introduction will be followed by Section 2, a chronological list of 'milestones' in the history of biology. Because the narrative of the paper will not be completely chronological (there will be 'flashbacks' from time to time), this chronology is intended to assist the reader. Section 3 will sketch the changes in Darwin's reputation up until about 1959, the Centennial of the publication of the *Origin of Species*. Changes in his reputation track changes in the scientific foundation of evolutionary theory in interesting ways. The growth of the Modern Synthesis is central to this narrative. The Modern Synthesis developed gradually from about 1930, and became the mainstream basis of evolutionary theory for the rest of the century. Section 4 will attempt to explain the basis of Darwin's changing reputation as a result of a combination of scientific changes and conceptual changes, changes in the meaning of certain terms. Section 5 will examine the development of the methodology of the Modern Synthesis, especially including Ernst Mayr's contributions to historiography regarding Darwin. This involves certain central dichotomies that were introduced around 1959, and the uses of these dichotomies in theoretical debates in the following years. Section 6 will discuss the persistence during the century of an alternative to the Modern Synthesis view of evolution, now called evolutionary developmental biology or *evo devo*. The central doctrine of *evo devo* is that ontogenetic processes (known from developmental biology) must be taken into account in order to understand the facts of evolution. This view was anathema to the Modern Synthesis up until the end of the century, but advances in molecular genetics have supported the view since the 1990s. Section 7 describes how Synthesis authors responded to the challenge from the predecessors of *evo devo*. Section 8 describes the rapid growth of *evo devo* and the way in which the methodology of the Synthesis had been seriously challenged by the emerging field. Section 9 offers a reconsideration of the role of Darwinian historiography in the debates of evolutionary theory during the twentieth century, and one final historical revision.

Chronological milestones

1. Nineteenth century beliefs and concepts regarding heredity, and Darwin's own beliefs about these topics.
2. Darwin's scientific reputation in 1909, as seen in the Cambridge UK meetings that celebrated the

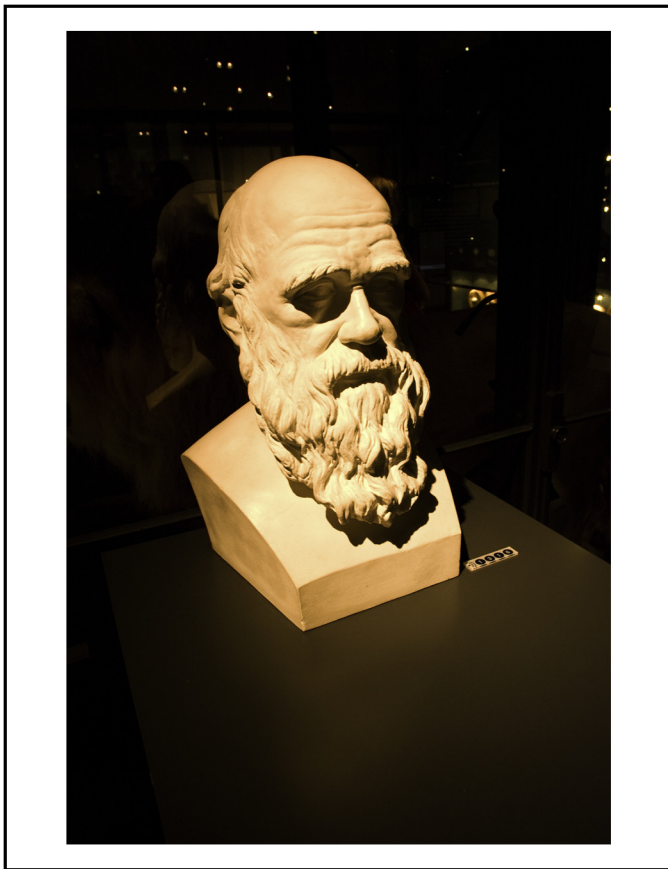


Figure 1. Bust of Charles Darwin at the Museum für Naturkunde in Berlin. Photo taken by the author. Note the similarity to the Ernst Mayr bust below.

Centennial of his birth, coinciding with the 50th anniversary of the publication of Darwin's *Origin of Species*.

3. The radical changes in factual beliefs about heredity brought about by Thomas Hunt Morgan and his colleagues with a 1915 publication (and consequent change in the meaning of the term 'heredity').
4. The development of the Modern Synthesis in evolutionary biology from about 1930 onward; Julian Huxley's revision of Darwin's reputation in 1942.
5. Continued changes in Darwin's scientific reputation as of 1959, coinciding with the 150th anniversary of Darwin's birth (the 100th Anniversary of the publication of the *Origin*).
6. The adaptation-versus-constraints debates from about 1975 onward, challenging what had become Modern Synthesis orthodoxy.
7. The methodological arguments that Synthesis advocates used to refute the advocates of developmental constraint.
8. The radical changes in scientific beliefs that began in 1990 regarding genetic homologies and the relevance of ontogenetic development to evolutionary change.
9. How current science favors evo devo, and how the Synthesis historiography must be revised.
10. A possible alternative view of Darwin and his contemporaries.

From 1909 to 1942: a fall and rise of Darwin's reputation

In 1909 Charles Darwin was well loved in the scientific community. This fact is well documented in the records of the 1909 Centennial celebration of Darwin's birth. This event, which took place in Cambridge UK, was reported to include scientists and dignitaries from 167 different countries. Details are provided in a 1909 anthology edited by A.J. Seward and carefully analyzed by Marsha Richmond.¹ Natural selection, as a long-term cause of evolutionary change, was viewed with skepticism by most thinkers during the late nineteenth and early twentieth centuries. Many other mechanisms, later disparaged, were live alternatives. These included use inheritance (also called Lamarckian inheritance), saltationist change (evolution by jumps), orthogenesis (directed evolution), and versions of teleological change. A belief in macromutations, a possible cause of saltationism, was encouraged by the rediscovery of Gregor Mendel's experiments around 1900. The papers in Seward's anthology illustrated this wide range of alternative mechanisms. But it also illustrated the great respect accorded Darwin, even by advocates of theories that seem very un-Darwinian to modern eyes. To be sure, what our modern eyes see as 'Darwinian' is something we must view very critically. And we will.

Descent with modification is the central doctrine of Darwin's work, and his arguments for that fact appear to be the basis for his high reputation in 1909. Natural selection was important to Darwin, but its actual operation was unknown until it was reconstructed by the Modern Synthesis. One reason that the 1909 meetings were so exciting was that experimental discoveries in biology were coming to light that showed the possibility of new directions in evolutionary theory and new experimental grounds for evidence regarding evolution. Richmond refers to the recent cytological evidence regarding meiosis, as well as the rediscovery of Mendel's work and other evidence seen as favorable for mutation. This increased the excitement attached to evolutionary theorizing, but was not seen as damaging to Darwin's reputation. Even Hugo de Vries, an advocate of mutation, considered Darwin an important influence and close friend.² Darwin held beliefs that were inconsistent with a number of the ongoing possibilities, but his reputation was undamaged. The delegates to this conference seemed unanimous in considering themselves 'Darwinians'. Darwin's own catalog of beliefs, some of popular and some of them idiosyncratic, were a side issue. Besides natural selection, Darwin had advocated use inheritance (often called Lamarckian inheritance), continuous blending heredity (as opposed to particulate heredity), and gradualist evolutionary change. Conflicting beliefs notwithstanding, enthusiasm for Darwin was undiminished. Darwin had convinced the scientific community that evolution had occurred; we are all Darwinians now (as would have been said in 1909).

¹ Albert Charles Seward, *Darwin and Modern Science* (Cambridge, UK: Cambridge University Press, 1909); Marsha Richmond, "The 1909 Darwin Celebration in Cambridge: Reexamining Evolution in the Light of Mendel, Mutation, and Meiosis", *ISIS*, 2006; 97: 447–484.

² Peter W. van der Pas, "The Correspondence of Hugo De Vries and Charles Darwin", *Janus*, 1970; 57: 173–213.

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