



Evolution from the Galapagos. Two centuries after Darwin

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2013. Springer Science+Business Media New York
 168 pp, 13.5 × 20.5 cm
 ISBN 978-1-4614-6731-1
 ISBN 978-1-4614-6732-8 (eBook)
 Price: € 103.99

Few maritime voyages deserve the honored place in history as that of the young Charles Darwin (1809–1882), who set out on at the end of December 1831 aboard the *HMS Beagle*, under the command of Captain Robert FitzRoy (1805–1865), almost as young as Darwin. The trip greatly exceeded its expected duration, returning to England after five long years. However, our historical memory is apparently short and the momentousness of that journey may soon be forgotten, since a Google search of “Beagle” will first provide entries related to the dog breed (that, by the way, gave the name to the ship)!

For any event with as many implications as those of Darwin’s journey, a consideration of its historical and social context is important, by placing it in a broader environment and thereby helping us to understand its reception—whether acceptance, rejection or indifference—and to assess its influence. As shown in the present book, *Evolution from the Galapagos. Two centuries after Darwin*, contemporary ideas about the origin of life and its evolution had a great impact on Darwin as he later formulated his theory.

The high intellectual level in 19th century English society, which included an intense interest in science, and recognition of the need to facilitate communication between experts, resulted in the creation of scientific societies. These were already well established in several European countries and in the USA. Their headquarters served as meeting places where members could comment on the latest scientific findings and discuss the advancement of knowledge in various fields.

In *Evolution from the Galapagos*, the first chapter, *Darwin-Wallace Paradigm Shift*, by Ricardo Guerrero and Lynn Margulis (1938–2011), shares with the reader the efforts of Charles Lyell and Joseph Hooker to conduct a joint presen-

tation of the work of Darwin and Wallace at the Linnean Society of London in July of 1858. Lyell and Hooker were both eminent Fellows of the Linnean. The latter can be considered a pioneer in modern geology, and Hooker was one of the greatest botanists and explorers of his time. Their insistence that the two studies be jointly presented is remarkable, although it was not the first time that researchers working independently had arrived at similar conclusions. Nonetheless, in their report, the two senior scientists pointed out clearly that the work of Darwin preceded that of Wallace. Indeed, primacy has long been a contentious issue and is not only a feature of modern-day science.

The chapter by Guerrero and Margulis (both of them Fellows of the Linnean) also describes in detail the vicissitudes that accompanied the presentation of the two documents before the Society in its meeting of July 1, 1858, and the lack of attention paid to what was subsequently recognized as a momentous event in the history of science. In fact, Thomas Bell, the Linnean’s president at the time, could not have made a bigger mistake as the one recorded in the minutes of that meeting. Bell did not appreciate the importance of Darwin and Wallace’s findings, and in the absence of the two authors (Darwin had remained at his home in Kent; Wallace was still in Indonesia) did not feel compelled to even mention their works in the annual report of the Society that he prepared for its members in May 1859.

The ten days between the planning of the meeting of the Linnean and its embodiment were hectic ones for the organizers. Unlike the Russian Revolution, as reported by John Reed (1887–1920), these ten days did not shake the world, at least not immediately, but they would substantially produce a para-

digm shift, undoubtedly one of the most important in the history of science. The work of both Darwin and Wallace, besides transforming existing ideas about the origin and evolution of life, established the foundation for future research and discoveries in the field of biology but also in many other fields outside strictly scientific ones.

In the second chapter, *From Copernicus to Darwin (1473–1882)*, Carlos Montúfar, one of the coeditors of the book, looks at the other major paradigm shift in our perception of the universe and our role in it as privileged beings. Prior to *De Revolutionibus Orbium Coelestium* (1543), the universe and the Earth were seen through a prism in which religious beliefs and ecclesiastical power played key roles. With its heliocentric model, Copernicus' work was the beginning of a long-lasting series of scientific breakthroughs that culminated with Darwin's grand theory of evolution and with modern evolutionary biology.

Evolution from the Galapagos is the second book in the series *Social and Ecological Interactions in the Galapagos Islands*. The series consists of lectures presented at the two "summits on evolution" that took place in GAIAS (Galapagos Institute for the Arts and Sciences) of the Universidad San Francisco de Quito on June 9–12, 2005, and August 22–26, 2009. The second meeting also commemorated Darwin's 200th birthday.

The different contributors to the book are well known scientists in their respective fields. Their areas of expertise include evolutionary biology, zoology, bacterial genetics, systematics, microbial evolution, molecular evolution, genetics, geosciences, chemistry, and physics. Special mention should be made of the contributions of Ada Yonath, who shared the 2009 Nobel Prize in Chemistry with Venkatraman Ramakrishnan and Thomas A. Steitz for studies of the structure and function of the ribosome, and the chapter by the second couple of the book (the first one being that of Guerrero and Margulis), Rosemary and Peter R. Grant, the senior authors of this series. The Grants are emeriti professors at the University of Princeton and recipients of a number of awards in recognition of their long and tireless research into Darwin's finches on the Galapagos Island Daphne Major.

The twelve chapters in this volume deal with questions about the origin of life, including the appearance of the first eukaryotes, and the role of symbiosis in evolution. Ecological selection is also considered, specifically, how disruptive ecological selection could serve as the driving force in the evolution. This is shown by the variation in body and sexual size dimorphism within a species and across species within a clade, based on the example of the flightless Galapagos cormorant.

This is a short book if one considers the seemingly endless aspects to be considered when the subject is evolution. Nevertheless, it deals with the most important aspects and especially those that have benefited from the large quantity of resources provided by new technologies, which have yielded new perspectives and knowledge. The authors of the book also remind us of the many questions about evolution that have yet to be answered and how much remains to be done in describing the organisms on Earth, how they evolved, and how they are related. Although we are well aware that there are many species on Earth that have not yet been described or identified, we do not know how many. For instance, it has been estimated that only 5 % of existing fungi are known. Moreover, in the words of Vaughan Southgate, past president of the Linnean Society, writing in the foreword of the book, "it is of crucial importance that we should know what is on Earth before it disappears forever." A good example is provided by the fourteen subspecies of tortoises. Three of them have disappeared while a fourth was represented by a single male specimen, named by its keepers as Lonesome George, and that died in 2012. There are also challenges to the preservation of the Galapagos Islands themselves, as the measures required to preserve their fragile ecosystems often conflict with the interests and needs of their population. Population growth has exacerbated the problem: according to the census of 1950 there were 1346 inhabitants on all of the islands, compared to 17,000 in the year 2000. Tourism also seems to be unstoppable, as the Galapagos Islands are visited by more than 60,000 persons per year.

Anyone interested in the origin and evolution of life should be grateful to the organizers of the meetings that resulted in the publication of this book, both for the quality of the chapters and, by holding the meetings in the Galapagos, reminding us of their fragile nature (the islands were declared a World Heritage Site by UNESCO in 1978 and a Biosphere Reserve in 1983). The efforts of the University of San Francisco de Quito, the founders of GAIAS, located on San Cristobal island, where Darwin arrived in October 1835, also deserve special mention.

The need for continued research into the origin and evolution of life was passionately recognized by Lynn Margulis, our dear colleague and good friend, who died on 22 November 2011. Gabriel Trueba and Carlos Montúfar have dedicated the book to this exceptional scientist and woman whose work on symbiosis revised many of our long held notions of evolution.

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