

Darwin's First Theory: Exploring Darwin's Quest for a Theory of Earth

by Rob Wesson

Pegasus, 462 pp. ISBN 978-1-68177-316-2 \$28.95

Reviewed by Roger Bilham

In *Darwin's First Theory*, Rob Wesson follows Darwin's geological excursions in the United Kingdom and South America. He marvels at Darwin's energy and observational skills, while we marvel at the energetic few years that Rob Wesson spent following him. Darwin's first theory concerns the ups-and-downs of continents and oceans, evidence for which he confronted at nearly every port of call on his four-year journey on the *Beagle*. While Robert Fitzroy, captain of the *Beagle*, sailed to and fro, fastidiously surveying the depths and coordinates of inlets and bays, headlands and harbors, Darwin had numerous opportunities for geological observations on land. These extensive on-land excursions resulted in copious notes in the proportion of three pages of geology to one page of animals. The product of his modest zoological page-count is legendary; less well known is his important contribution to the study of the tectonics of islands and continents. It is this forgotten side of Darwin that Wesson explores.

The book expertly and amusingly intertwines what we know now with what Darwin knew then, and it goes into why Darwin's observations ultimately overcame resistance from those in the scientific community who were opposed to the notion of rock uplift. At that time, many believed that rocks had settled in position after a Biblical flood and that they descended to lower levels under the influence of gravity. True, volcanoes tossed rocks in the air, but how could other rocks rise? In successive editions of his *Principles of Geology*, Charles Lyell had highlighted a couple of inconvenient examples of uplift in the Roman port of Pozzuoli near Naples and accompanying the 1819 Bhuj earthquake in India, but there remained stout opposition to obvious uplift. From observations of seismically raised beaches and marine shells high in the Andes, Darwin's observations gave substance to the probable link between incremental tectonics, volcanoes, and mountain growth in continents, as well as to the steady subsidence of oceanic islands as recorded by the growth of corals. His theories of uplift were missing many of the details that prevented the formulation of what we now embrace within

The product of Darwin's modest zoological page-count is legendary; less well known is his important contribution to the study of the tectonics of islands and continents. It is this forgotten side of Darwin that Wesson explores.

plate tectonic theory, but his theory on the formation of coral islands has stood the test of time.

Rob Wesson's wonderful sense of humor shines through the pages of his book. I recall his description of one famous occasion in the giddy 1970s when seismologists thought that earthquake prediction was just around the corner; he brought the house down with his opening sentences to a packed audience in Stanford: "As scientists, it is obvious that we can predict earthquakes. After all, astronomers are scientists, and they can predict eclipses." In the telling of Darwin's adventures in geophysics, Wesson has lost none of his vivacity, his loquacity, or his tongue-in-cheek sense of humor.

As a result, this is a terrific read. A dozen mini-adventures are embedded within its pages, each with a handful of facts and puzzles, in addition to menus, boat rentals, and character sketches. The author savors the excitement that young Charles (aged 24) would have felt as he wandered the coastlines and mountains of South America. In one macro-adventure, Wesson visits the coast where Darwin described being shaken by the startling inbound tsunami of the 1835 Chilean earthquake. Wesson seeks and finds the uplifted terrace on Santa Maria Island described by Fitzroy in 1835 (then characterized by the putrid stench of decaying barnacles), and has the ambitious notion of remeasuring the bathymetry of the nearby bay mapped by the crew of the *Beagle*. Off he and friends go in a splashy-splishy skiff armed with Global Positioning System (GPS) and depth sounder to discover that in the 180 years since Darwin's earthquake, the bay has deepened by almost 5 feet due to inter-seismic subduction. Then, just a year and an airline ticket later, the great 2010 Maule earthquake and tsunami

obligingly raises the island, shallowing the bay to depths similar to those observed by Darwin and Fitzroy and re-exposing the putrid wave cut terrace. This event also served to offer insights into the historical tsunami in the form of fresh debris covering the shorelines that Wesson had visited in previous years.

Although it was remarkable to see how much Darwin is still remembered throughout the world, there is much more to the book than following the signs of "Darwin slept here." Wesson is armed with the luxury of Gore-Tex and airline tickets, as well as the superior insights afforded by plate tectonics. However, in Wesson's ingenious hands, this only adds to the excitement of rediscovering Darwin. He ponders the recent, still-unexplained demise of the gigantic mammals of South America, the contradictory evidence for uplift and subsidence provided by its abandoned marine and river terraces, and glacial erratics. He captures

Darwin's observations as teachable moments and disarmingly shows how some of these disparate facts led Darwin into cul-de-sacs that have now been abandoned.

In his closing chapters, Wesson launches into a broader, more reflective view of geology, geophysics, physics, and the peculiarities of the prodigious brain of the homo sapien—a brain that is equipped on the one hand to sort out its own improbable 4.6-billion-year genesis, but which when provided with incomplete information can lamentably conclude that it all started in the Garden of Eden. Wesson's book may

drive you, as it did me, to reach for the original writings of young Darwin, who during the day pole-vaulted to the edges of coral reefs to gather specimens and at night synthesized overwhelming amounts of observational data from his notebooks and the writings of others. Darwin would have been delighted that his books and diaries are available online, free to anyone with an inquisitive mind and an Internet connection. He would also have been tickled to learn how many of his early geological observations fit the grand scheme of plate tectonics. ☒

Become a Student Member Today!

Current students can get a substantial discount on their SSA Membership—just \$25 for a full year when they sign up at www.seismosoc.org/membership.

Join your fellow seismologists, and enjoy benefits like:

- Electronic access to the *Bulletin of the Seismological Society of America (BSSA)* and *Seismological Research Letters (SRL)*
- Electronic access to past Annual Meeting presentations
- Travel grants and presentation awards available for the SSA Annual Meeting
- Access to the SSA online membership roster

Student members also qualify for discounted member rates for their first three years after graduation or leaving school. Learn more about SSA Student Membership at www.seismosoc.org/students



SEISMOLOGICAL SOCIETY of AMERICA 510-525-5474 • info@seismosoc.org • www.seismosoc.org