Biogeography

Alfred Russel Wallace

Today Alfred Russel Wallace (left) is a prisoner of scientific parentheses, as in, "the theory of evolution by natural selection proposed by Charles Darwin (and also by Alfred Russel Wallace)." Yet Wallace was a great naturalist in his own right, particularly in the way he used evolutionary theory to interpret the natural world. In one of his most important applications, he helped found the modern science of biogeography — the study of how species are scattered across the planet, and how they got that way.

Patterns of species' ranges

Wallace had already accepted evolution when he began his travels in 1848 through the Amazon and Southeast Asia. On his journeys, he sought to demonstrate that evolution did indeed take place, by showing how geography affected the ranges of species. He studied hundreds of thousands of animals and plants, carefully noting exactly where he had found them. *The patterns he found were compelling evidence for evolution. He was struck, for example, by how rivers and mountain ranges marked the boundaries of many species' ranges. The conventional explanation that species had been created with adaptations to their particular climate made no sense since he could find similar climatic regions with very different animals in them.*

Wallace's 1876 book, *The Geographic Distribution of Animals*, has plates depicting the animal life of the biogeographic regions he identified. These are mammals typically found in the forests of Borneo.

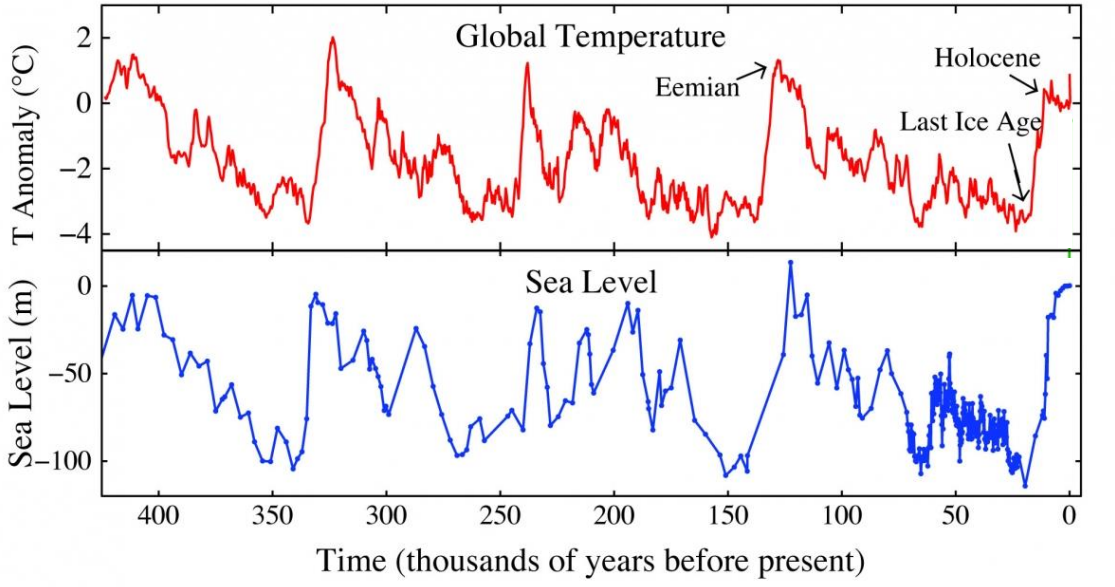
Wallace came to much the same conclusion that Darwin published in the Origin of Species: biogeography was simply a record of inheritance. As species colonized new habitats and their old ranges were divided by mountain ranges or other barriers, they took on the distributions they have today.

This map from Wallace's 1876 book shows his Oriental biogeographic region, broken into four subregions. The Wallace Line" is indicated by the arrow.

Wallace pushed the study of biogeography to grander scales than Darwin. As he traveled through Indonesia, for example, he was struck by the sharp distinction between the northwestern part of the archipelago and the southeastern, despite their similar climate and terrain. Sumatra and Java were ecologically more like the Asian mainland, while New Guinea was more like Australia. He traced a remarkably clear boundary that snaked among the islands, which later became known as "Wallace's Line." He later recognized six great biogeographical regions on Earth, and Wallace's Line divided the Oriental and the Australian regions.

Changing Sea Levels
over the last 400,000 years

Figure 1: *Sea level has risen and fallen at regular intervals over the last half a million years. During an ice age, more water is taken up in the ice caps, and sea level drops, exposing land previously underwater, and often connecting whole island chains into a single landmass.*



Motion of the Australian Plate

Figure 2: *The Australian tectonic plate broke off from Antarctica about 100 million years ago and has been moving towards the Eurasian plate ever since. This means that they were previously separated by thousands of miles of open ocean and just became close relatively recently (the last few million years), hence the* Wallace Line *dividing the flora and fauna of this region.*