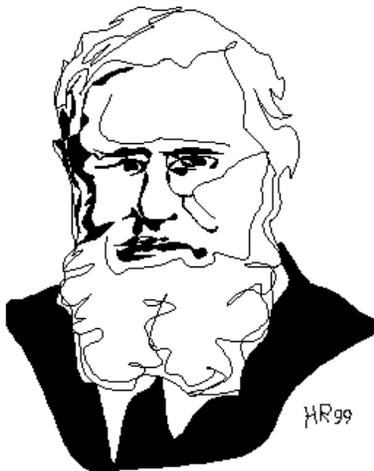


f30 Wallace's Line < a strait >

We [Wallace and I] differ only, that I was led to my views from what artificial selection has done for domestic animals. —Darwin (1858).¹

The strait [between Bali and Lombok islands] is 15 miles wide, so that we may pass in two hours [in a sailing boat] from one great division of the earth to another, differing as essentially in their animal life as Europe does from America. —Wallace (1863).²

Today, six realms with dissimilar groups of plants and animals exist (**Figure f30.1**). The “biogeographic” borders between them are barriers to easy migration. The barriers are: a forested land bridge filter between Neotropical and Nearctic (*ne* = New World) Americas; dry desert between Ethiopian and Palearctic (*pale* = Old World) regions; icy sea between Nearctic and Palearctic regions; high elevation cold desert between Palearctic and Oriental realms; and, in the tropical area where Oriental and Australian realms meet, a narrow, deep, strait. Here, the greatest contrast of all is found. Delineated on biogeographical maps as Wallace’s Line (so named by Huxley to honor naturalist **Alfred Russel Wallace** (1823-1913) who first described it), there are northwest of it, primates, squirrels, tigers, and hooved mammals in the Oriental realm, and southeast of it, marsupials (pouched animals such as kangaroo) and monotremes (egg-laying mammals such as the platypus) in the Australian realm.³



Wallace’s Line remained a strait even when, during the Ice Age, sea levels lower by “75 fathoms” exposed the shelf to its west and to its east had made one land (Australasia) of New Guinea, Australia and Tasmania. Wallace’s Line is as far as Oriental animals could walk east during low stands of the sea during Ice Age glacials. Australasian animals during those times could walk throughout their range but between the two realms

are islands that remained unreachable for these and for poor-flying animals. This region of islands has been named *Wallacea* to honor Wallace. Now in the mountain forests and mangrove forests of the islands of Wallacea, chance arrivers have diversified in the absence of competition that apparently limits their stay-at-home relatives. In 1854, pondering the significance of this and having read *Vestiges of the Natural History of Creation* (1844),⁴ Wallace was:

suffering from a sharp attack of intermittent fever [**Footnote f30.1**], and every day during the cold and succeeding hot fits had to lie down for several hours, during which time I had nothing to do but to think over any subjects then particularly interesting me. One day something brought to my recollection Malthus’s ‘Principles of Population,’ which I had read twelve years before. I thought of his clear exposition of ‘the positive checks to increase’—disease, accidents, war, and famine—which keep down the population of savage races to so much lower an average than that of more civilized peoples. It then occurred to me that these causes or their equivalents are continually acting in the case of animals also; and as animals usually breed much more rapidly than does mankind, the destruction every year from these causes must be enormous in order to keep down the numbers of each species ... as otherwise the world would long ago have been densely crowded with those that breed most quickly. ... Why do some die and some live? And the answer was clearly, that on the whole the best fitted live. From the effects of disease the most healthy escaped; from enemies, the strongest, the swiftest, or the most cunning; from famine, the best hunters or those with the best digestion; and so on. Then it suddenly flashed upon me that this self-acting process would necessarily *improve the race*, because in every generation the inferior would inevitably be killed off and the superior would remain—that is, *the fittest would survive*.⁵

(From whence came the phrase “survival of the fittest,” cast so in 1864⁶ by X-Club member Herbert Spencer (1820-1903) in his *Principles of Biology* series beginning 1862⁷—and not by Darwin who came to employ the expression in *Variation*, 1868,⁸ and, at Wallace’s suggestion, in *Origin*, 1869, 5th,⁹ and later editions.) This was the same theory of evolution that, unbeknown to him, Darwin had long apprehended and for its dispiriting truth had chosen to withhold from publication.

Wallace took the time while recovering from that bout of malaria on the Molluccan island of Halmahera to communicate his theory of evolution by natural selection in a letter, dated February, 1858, sent mailboat from Ternate to his occasional correspondent Darwin in England.¹⁰ When read, June 1858, Darwin recognized that Wallace in Malaya had anticipated his yet to be published theory of evolution by the same process of natural selection that he entertained. Darwin was conflicted:

There is nothing in Wallace’s sketch which is not written out much fuller in my sketch copied in 1844, & read by Hooker some dozen years ago. ... But as I had not intended to publish any sketch, can I do so honourably because Wallace has sent me an outline of his doctrine?—I would far rather burn my whole book than that he or any man shd. think that I had behaved in a paltry spirit.¹¹

The question of priority, upon the advice of Darwin’s friends, geologist Charles Lyell and botanist Joseph Hooker, found an amicable resolution. Known to later history as the “delicate arrangement” (**Footnote f30.2**), they read to the Linnean Society of London, on 1 July 1858, a joint presentation (published 20 August 1858)¹² of some unpublished letters and manuscripts by Darwin, establishing his priority, and Wallace’s “Ternate essay” (as it became called): *On the Tendency of Varieties to Depart Indefinitely from the Original Type*. Neither Darwin nor Wallace were present. The thirty fellows who were there did not extend the evening further than necessary for the exercise in priority and a paper, with a contrary thesis, scheduled to be read, was not.

How did the papers by Darwin and Wallace compare? Charlotte Sleight in 2002 offers:

Wallace stressed competition in relation to the environment (whether organic or inorganic) and between species, rather than the interspecific competition, or ‘ten thousand wedges’, which forms a major part of Darwin’s *On the Origin of Species* [1859] and has retrospectively been defined as its crucial argument. In this respect, Wallace is more responsible than Darwin for the layperson’s understanding of evolutionary factors—a struggle against predators rather than against one’s fellow-species.” Also, Wallace emphasized “the distinction between domestic and natural varieties.’ The latter are defined for him by the organism’s need for the variant characteristic, its competitive advantage against other varieties, and (in 1858 at least) its strengthening through use. Together these factors produced an irreversible directionality in the genesis of new varieties in nature. Darwin, meanwhile, although he agreed with all these points individually, preferred to stress the similarities between natural and domestic variants in the construction of his argument.¹³

As for behavioral morals, which for Wallace set humans apart from animals, Darwin could tease (in *Descent*) that had we evolved the same reproductive biology as bees, “there can hardly be a doubt that our unmarried females would, like the worker bees, think it a sacred duty to kill their brothers, and mothers would strive to kill their fertile daughters.”

In subsequent of his publications bearing on evolution, Wallace referred to natural selection as “Darwin’s theory.” And by 1869 (through to a last published paper in 1889) abdicated from a shared stewardship of its dispiriting truth by claiming that to cause human mental and cultural development an “immaterial spirit” has intervened. Darwin wrote him: “I hope you have not murdered too completely your own and my child.”¹⁴ □

Footnote f30.1 Fiammetta Rocco in *The Miraculous Fever-Tree*, 2003, tells that Jesuits in Peru noticed that when attacked with shivering fits in high-altitude cold, the Indians drank infusions of cinchona bark. Since medicine, as then practiced, was to treat the symptom (not the disease, which was cause unknown) try quinine

on the feverish shivering that is a prime symptom of malaria [“bad air”]. Swamp gases remained the preferred explanation until in 1880 the French physician Charles-Louis-Alphonse Laveran discovered the parasite responsible for malaria. Finally, in India, an English doctor Ronald Ross showed by painstaking experiments how the parasite passes from mosquito to human and back to mosquito, and how quinine blocks the process.¹⁵

Footnote f30.2 London, June 30th, 1858. MY DEAR SIR, —The accompanying papers, which we have the honour of communicating to the Linnean Society, and which all related to the same subject, viz. the Laws which affect the Production of Varieties, Races, and Species, contain the results of the investigations of two indefatigable naturalists, Mr. Charles Darwin and Mr. Alfred Wallace.

The gentlemen having, independently and unknown to one another, conceived the same very ingenious theory to account for the appearance and perpetuation of varieties and of specific forms on our planet, and both fairly claim the merit of being original thinkers in this important line of inquiry; but neither of them having published his views, though Mr. Darwin has for many years past been repeatedly urged by us to do so, and both authors having now unreservedly placed their papers in our hands, we think it would best promote the interests of science that a selection from them should be laid before the Linnean Society.

Taken in the order of their dates, they consist of: —

1. Extracts from a MS. work on Species*, by Mr. Darwin, which was sketched in 1839, and copied in 1844, when the copy was read by Dr. Hooker, and its contents afterwards communicated to Sir Charles Lyell [in this letter to Lyell in 1856, Darwin described his work on a “preface” (including *An Historical Sketch* respectful of the related work of others and which sop is in *Origin, 3rd edition on*, because “I forgot all about it”)¹⁶]. The first Part is devoted to “The Variation of Organic Beings under Domestication and in their Natural State;” and the second chapter of that Part, from which we propose to read to the Society the extracts referred to, is headed, “On the Variation of Organic Beings in a state of Nature; on the Natural Means of Selection; on the Comparison of Domestic Races and true Species.”

2. An abstract of a private letter addressed to Professor Asa Gray, of Boston, U.S., in October 1857, by Mr. Darwin, in which [p. 46] he repeats his views, and which shows that these remained unaltered from 1839 to 1857.

3. An Essay by Mr. Wallace, entitled “On the Tendency of Varieties to depart indefinitely from the Original Type.” This was written at [*sic*, was mailed from] Ternate in February 1858, for the perusal of his friend and correspondent Mr. Darwin, and sent to him with the expressed wish that it should be forwarded to Sir Charles Lyell, if Mr. Darwin thought it sufficiently novel and interesting. So highly did Mr. Darwin appreciate the value of the views therein set forth, that he proposed, in a letter to Sir Charles Lyell, to obtain Mr. Wallace’s consent to allow the Essay to be published as soon as possible. Of this step we highly approved, provided Mr. Darwin did not withhold from the public, as he was strongly inclined to do (in favour of Mr. Wallace), the memoir which he had himself written on the same subject, and which, as before stated, one of us had perused in 1844, and the contents of which we had both of us been privy to for many years. On representing this to Mr. Darwin, he gave us permission to make what use we thought proper of his memoir, &c.; and in adopting our present course, of presenting it to the Linnean Society, we have explained to him that we are not solely considering the relative claims to priority of himself and his friend, but the interests of science generally; for we feel it to be desirable that views founded on a wide deduction from facts and matured by years of reflection, should constitute at once a goal from which others may start, and that, while the scientific world is waiting for the appearance of Mr. Darwin’s complete work, some of the leading results of his labours, as well as those of his able correspondent, should together be laid before the public.

We have the honour to be yours very obediently,

CHARLES LYELL. JOS. D. HOOKER. J. J. BENNETT, ESQ., Secretary of the Linnean Society.

* This MS. work was never intended for publication, and therefore was not written with care.—C.D. 1858.

Figure f30.1¹⁷

Originally named by Philip Lutley Sclater (1829-1913) for bird (mostly passerine) distributions¹⁸ are 6 distinct realms of flora and fauna separated by species transitions zones (black areas).

Wallace’s Line, which runs through the ocean between Bali and Lombok, Celebes and Borneo, and the Moluccas and the Philippines, separates the world of tigers from the world of kangaroos.

