

## Wallace's belated revival

SAHOTRA SARKAR

*Department of Philosophy and Redpath Museum, McGill University, 855 Sherbrooke St. W.,  
Montreal PQ H3A 2T7, Canada*

*(Fax, 514-398 7148; Email, sahotra@philomcgill.ca)*

### 1. Introduction

On the 8th of January, 1858, on the morning of his thirtyfifth birthday, Alfred Russel Wallace arrived on a mail boat at Ternate, an island in the Maluku group of what is now Indonesia. There, he bought a square house, forty feet on each side; it served as his home for the next three years, in between his wanderings around the other Maluku and Aru islands and a visit even to distant and almost inaccessible New Guinea. But the most important event of his scientific life occurred almost immediately. In spite of bouts of malarial fever resistant even to large doses of quinine, Wallace voyaged to nearby Gilolo (present-day Halmahera) in order, as usual, to collect insects and other animals, the sale of which alone provided him with the wherewithal to continue with his exploration of the natural history of the East Asian tropics. In Gilolo, Wallace suffered from one of his worst bouts of fever and returned to Ternate on the 1st of March in an exhausted state. But, while at Gilolo, or immediately upon his return, an idea—the solution to the “species problem”—had begun to crystallize in his mind. At Ternate, the fever resulted in alternate hot and cold fits during which Wallace could do nothing but lie down and think over any subjects that interested him. During one of these fits, as he recalled later (Wallace 1898), he came to realize that Malthus’ principle of the growth of populations provided a principle of natural selection that explained the remarkable adaptation of organisms to their environments. More than that, once the latter principle was coupled with the pervasive heritable variation among organisms within any population, natural selection could pull different sub-populations in different directions. This led to the principle of divergence which finally solved the “species problem”, how one species was transformed into another and how different species continued to diverge during the course of evolution.

By about the 6th of March Wallace had transformed

his insight into a 3,764-word paper, ‘On the Tendency of Varieties to Depart Indefinitely from the Original Type’ (Wallace 1859). Probably on the 9th, when a Dutch cargo vessel left Ternate, he sent it to Darwin.

When Darwin received it is a matter of historical controversy (McKinney 1972; Bradman 1980; Brooks 1984). Circumstantial evidence strongly suggests that Darwin received it on the 3rd or 4th of June; a letter sent by Wallace on March 9th to another naturalist, Henry Walter Bates, arrived in Leicester on the 3rd of June. But Darwin later publicly claimed to have only received it on the 18th of June. The discrepancy of dates is critical to the question whether Darwin made unacknowledged use of Wallace’s ideas during what was to be his first formulation of the complete theory of evolution by natural selection. According to Darwin, it was on the 8th of June that he, too, had independently discovered the principle of divergence, the critical missing piece of the theory of evolution that he had been groping towards for decades. That principle was critical because it was necessary to explain perhaps the most puzzling aspect of speciation, why species begin and continue to diverge after their formation. In a sense it was even more important than the principle of natural selection which Darwin had already formulated in the 1840s. At the very least Wallace had arrived at both principles independently, and certainly earlier than Darwin as far as the principle of divergence is concerned. But there is good reason to suspect that the principle of divergence only occurred to Darwin after his perusal of Wallace’s paper. Strangely, Darwin did not preserve either Wallace’s manuscript, the accompanying letter, or the envelope, the post-marks on the last of which would have established the day on which the paper reached his hands.

### 2. Lapse into obscurity

The rest of the story is well-known. Wallace’s manuscript

was an expository masterpiece presenting the theory of evolution by natural selection with such clarity and precision that it remains of pedagogic value even today. During the preceding two decades Darwin had been patiently collecting data for a major work on evolution. Wallace's manuscript seemed to have pre-empted him completely, so much so that he considered abandoning his own work. At this point two friends, the geologist Charles Lyell and the botanist Joseph Dalton Hooker, two of the leading luminaries of English science, intervened. Wallace's paper was to be presented to the prestigious Linnean Society and published in its Proceedings, but only along with something by Darwin thus protecting the latter's claim to priority. But Darwin had nothing presentable. So Lyell and Hooker, with Darwin's collaboration, salvaged extracts from an unpublished essay written in 1844 and from a letter written to the US botanist Asa Gray. These were presented to the Linnean Society on the 1st of July and published in August; Darwin's contributions were put ahead of Wallace's on both occasions. Darwin rushed to prepare a 540-page abstract of the larger work that he had envisioned. It appeared in 1859 as *On the Origin of Species by Means of Natural Selection* and created an intellectual revolution.

On the other side of the globe, Wallace had no say on the manner in which his manuscript had been handled. Early in 1860 he received his own copy of the *Origin*. It may have convinced him to continue his explorations in the East Asian tropics. There was no point in immediately returning to England even though he knew, from correspondence with Bates, Darwin, and others, that his Ternate paper was important. His own contribution seemed mundane compared to Darwin's massive work. Nevertheless, the Ternate paper was actually Wallace's second major contribution to evolutionary theory. In early 1855, while at Santubong, on the Sarawak coast (off Borneo), he had written another paper, "On the Law which has Regulated the Introduction of New Species", which was published in September in the *Annals and Magazine of Natural History*. In it he argued that every new species had arisen in spatial and temporal continuity with some other species closely allied to it. Among other things, this was the paper that finally made Charles Lyell waver in his faith in the fixity of species. Conceptually, it was a natural precursor of the theory that he and Darwin later formulated. The observation of contiguity of allied species set the stage for an investigation of the mechanism by which one may have directly arisen from the other. The 1858 paper closed that investigation.

Wallace's admiration for the *Origin* and for Darwin was genuine. He routinely claimed that he would never have been able to accumulate the evidence that Darwin had patiently brought forth in support of the theory.

Later in life, when he published his own version of the theory, he simply called it *Darwinism: An Exposition of the Theory of Natural Selection, with Some of Its Applications* (Wallace 1889). This may have contributed to his own eventual neglect (see below).

In 1862 Wallace finally returned to England after having wandered for eight years around what is now Malaysia and Indonesia. Though he received a warm welcome in most naturalists' circles, it did not translate into acquiring a suitable position that would guarantee him any measure of financial security, presumably because of his lower social status, especially when compared with that of Darwin, Hooker and Lyell. For financial support, he continued to rely on the sale of the specimens he had collected and periodically shipped back to Europe and, later, on the royalties from his writings. The most important of the latter was a book, *The Malay Archipelago*, based on his travels in Malaysia and Indonesia (Wallace 1869). It fits only uncomfortably into the genre of the Victorian travel narrative. For one thing, it is not temporally organized. Wallace's travels had been too complicated, with dozens of visits to some places, for a temporally linear narrative to have been comprehensible. Rather, the book is organized into regions, groups of islands such as the "Indo-Malay" islands (the Malay peninsula, Singapore, Borneo, Sumatra and Java), the Timor group (Timor, Flores, Sumba and Lombok), and so on. What was most original about this method was that the principle of organization was the distribution of species—the significance of this move will be discussed in the next section.

Equally importantly, *The Malay Archipelago*, more so than any previous work, incorporated the still novel theory of evolution completely into the discussion of natural history. Finally, the natural history is integrated into remarkable excursions into anthropology. Wallace's descriptions of the patterns of cultural and social behaviour of the various ethnic groups he encountered are careful. In the Victorian context, they are surprisingly free of eurocentric prejudices. Though he has little hesitation in calling some of these groups "savages", at the end of the book, with respect to moral worth, he compares them favorably to the English. To some extent this reflects his politics; he had been an Owenite socialist since his youth and never abandoned the faith. He had also never forgotten his lower class origins, the utter poverty of his youth, or the discrepancies in the distribution of wealth in Victorian England. But, even given that, the openness of mind with which he approached the people and customs he encountered in his travels cannot be ignored. (He compares particularly well when compared to a better-known contemporary socialist, Karl Marx, whose account of the so-called Asiatic mode of production shows little attempt to understand local economic practices in their own contexts.)

In England, in a series of characteristically lucid papers, Wallace continued to develop the theory of evolution in parallel to Darwin. Though these were collected into books, and otherwise reprinted, they have never received the attention that they deserve. In particular, it has gone unnoticed that, on many important technical points, Wallace broke with the Darwinian orthodoxy that was gradually entrenching itself. Most importantly, he had little sympathy for sexual selection (and, thus, his evolutionary theory was more consonant with that of much of this century's evolutionary theory before 1970 than what Darwin had eventually come to believe). Wallace also came to doubt that natural selection alone could account for human mental capacities.

In spite of this ongoing work on evolutionary theory—and many important contributions to natural history and biogeography (see below)—by the 1880s, Wallace came to be marginalized. No doubt this was partly because of several quixotic political and other projects on which he enthusiastically embarked. He coupled his skepticism about the evolution of human mental faculties to a belief in spiritualism. He emerged as a critic of vaccination programmes. With more reason from a modern point of view, and true to his socialist politics, he campaigned for land nationalization. Nevertheless it is hard not to suspect that Victorian prejudices against his low social origins—he was almost entirely self-educated and, especially unlike the wealthy Darwin, had supported his science by becoming a professional specimen collector in the indirect employment of those for whom their collection was a gentlemanly hobby—had much to do with his marginalization when he continued to maintain his intellectual and political independence.

Much more surprisingly, 20th century biology and history of science have marginalized Wallace to an even greater extent. At least in the 19th century literature, the theory of evolution was usually referred to as "Darwin and Wallace's theory". In the 20th century, the theory of evolution has become virtually synonymous with Darwinism or neo-Darwinism. In the history of science, a Darwin industry has long dominated the history of biology. Almost every decade has seen the publication of a new significant biography of Darwin. Darwin's entire correspondence is in the process of being published with annotations. There has been no full biography of Wallace since the 1960s and no scholarly biography ever. [George (1964) comes closest to a scholarly biography; many books such as Bradman (1980) and Brooks (1984) provide some biographical detail.] I know of no significant paper on Wallace's scientific work after 1859. Most of Wallace's surviving correspondence remains unpublished.

### 3. Biogeography

What makes Wallace's historical neglect astounding is

that his contributions do not end with the co-discovery of the theory of evolution. During the course of his wanderings around the east Asian tropics Wallace made one startling observation that marks the beginning of a theoretically informed biogeography. This was the observation that, with respect to the distribution of animals, the archipelago could be divided into two parts of almost equal area.

The fauna of the western part resembled that of India; that of the eastern part, the fauna of Australia. (Wallace named the former the "Indo-Malayan" and the latter the "Austro-Malayan" division.) A line could be drawn clearly separating these two parts. What was striking about this line was that sometimes it passed through straits of remarkable narrowness. For instance, Bali belonged to the Indo-Malayan division and Lombok to the Austro-Malayan division. The strait separating them was barely 15 miles (24 km).

Wallace (1869) notes the strangeness of this phenomenon: "The strait is here fifteen miles wide, so that we may pass in two hours from one great division of the earth to another, differing as essentially in their animal life as Europe does from America." Clearly, his discovery of this line was important. This line has come to be called "Wallace's line." Wallace first proposed it in a paper published in *Ibis* in 1859; it was revised several times and first systematically put to use in *The Malay Archipelago*, where the distribution of fauna and flora form the real basis for the organization of islands into groups, and further revised many times, especially in *Island Life* (Wallace 1880). With respect to one island cluster, Wallace changed his mind several times about the position of the line. Sulawesi (the Celebes) proved to be anomalous and it kept moving back and forth between the Indo-Malayan and Austro-Malayan divisions in his work. In the period following its first publication, the idea of such a line was popular. Huxley produced an alternative in 1858; Lydekker in 1896 and Weber in 1904 produced rather different versions. Nevertheless, in the early decades of the 20th century the line fell into disfavour.

What is interesting about Wallace's use of the line is that, from this observation, he concluded that the islands of the Indo-Malayan division were once connected to each other and to the Asian mainland; the islands of the Austro-Malayan region and Australia were similarly connected; but that the two divisions had always been separate. More than that, he went on to use faunal distributions to hypothesize, within each division, which islands became disconnected from others in what temporal order. Patterns of biological species distribution thus became techniques for the prediction of geological history. In this sense, Wallace's arguments in *The Malay Archipelago* mark the beginnings of biogeography as a theoretically mature science. In 1924, in the third edition of

*The Origin of Continents and Oceans*, Wegener adopted Wallace's argument. He used the existence of Wallace's line as evidence for continental drift. But, once continental drift came to be accepted, in a reversal of the direction of Wallace's and Wegener's arguments, the line regained its reputation. However, the exact position of the line in some cases continues to be debated. From the biological point of view, Sulawesi remains problematic. Quite early, Dickerson (1928) even argued that it should be regarded as part of a third division (which he named "Wallacea"), a suggestion that had already been made by Wallace in 1863. This may well be the solution of many existing anomalies. [For a fuller history, see George (1981).]

#### 4. The revival

Wallace's years in undeserved obscurity seem finally to be over. It began with the popular science writer David Quammen whose work on a book on the increasing pace of species' extinctions [*The Song of the Dodo*—Quammen (1996)] took him around the world. In particular, it took him to the Aru Islands in search of birds of paradise. And, as often happens when one encounters nature in Indonesia or Malaysia, the benign ghost of Wallace haunted Quammen as it haunts any aspiring naturalist. For *The Malay Archipelago* is not only a work of singular scientific importance; it is also a work of striking literary skill. Quammen meditates on Wallace throughout *The Song of the Dodo*, on his travels, on his concern for the disappearance of natural habitat, his relatively unprejudiced observations of "native" cultures, his probable loneliness... Wallace emerges from the shadow of Darwin as premier biogeographer and incipient conservationist, a collector and hunter no doubt, but one with an acute perception of the threat that rampant destruction posed to the very survival of the organisms closest to the naturalist's heart. Quammen struck at an opportune moment. In the 1990's, while ecologists and other biologists publicly prophesied a morbid future bereft of biological diversity, conservation biology had emerged as the science of romance in neo-Europe and Europe. Wallace emerged from his ill-deserved obscurity to be heralded as a prophet of biological conservation.

Shortly thereafter, in 1996, the adventurer and writer, Tim Severin, set out to recreate Wallace's voyages at the western end of the Indonesian islands. Travelling on a specially-constructed prahu christened "Alfred Wallace"—a traditional local vessel similar to the ones that Wallace must have used—Severin and his crew followed Wallace's trail between the Maluku islands, the Aru islands, New Guinea, and to Sulawesi. In some places such as the harbour of Banda they found land-and sea-scapes of unsurpassed beauty little changed from Wallace's day. In others, desolation from poverty or population underscored the environmental threats that

Wallace had so carefully recorded in *The Malay Archipelago*. Severin and his crew also visited marine and land nature reserves where modern conservationists had attempted to preserve pockets of undisturbed wildlife by forced human exclusion and interventionist measures formulated by distant conservation organizations in Jakarta or even North America such as the World Wide Fund for Nature (WWF). They came away disappointed. Traditional use of natural resources including the (illegal) controlled harvesting of endangered species such as the Red Bird of Paradise, which Wallace had much difficulty finding some 140 years earlier, led to better conservation than the policy of setting up unpopular and unnecessarily expensive national parks (Severin 1997). The Red Birds of Paradise were flourishing in spite of the harvest.

At the same time that Severin and his crew were exploring the western extremities of Wallace's travels in Asia, I was following his trail at its eastern end from Singapore, through peninsular Malaysia to Sarawak (one of the two Malaysian provinces on the island of Borneo) and, finally, to Java, Bali and Sulawesi in Indonesia. My purpose was to chart the course of biological destruction in the region using the minutely detailed *The Malay Archipelago* as a description of the region before the massive ecological, economic and social changes of the last three decades. In Sarawak, especially, traces of Wallace or his observations were hard to find. There is no sign of the house in Santubong where he wrote the Sarawak paper foreshadowing the theory of evolution. There were no remnants of the lowland rain forests in which orang-utans had been so abundant that they were a menace to the local villagers. Logging had destroyed them. The only remnants of primary forests here were in a few scattered national parks, most of so small a size as to be biologically insignificant. Like Severin, I also came to question the wisdom of national park strategy for biodiversity conservation. Setting up a park here and there had provided the Sarawak authorities a rationale to pursue uncontrolled destruction of forests up to their borders (in many other areas, Quammen had also noticed this problem). Traditional patterns of land use would have led to a much greater persistence of biological diversity while, at the same time, been much less destructive to indigenous patterns of life. I have no doubt that Wallace would have agreed. But he would probably have also pointed out that at least some of the cultural practices of the Dayak ethnic groups, which he had come to appreciate, had still survived. That was perhaps the only trace of Wallace that was left in Borneo. Nevertheless, it was inspiring. (A book, *The Wallace Trail*, is in preparation.)

The new-found interest in Wallace as biogeographer and incipient conservationist is obviously welcome. But, only if it leads to a critical re-examination of his entire intellectual corpus—especially his role in developing the

theory of evolution, the significance of his disputes with Darwin, besides his work on biogeography—will this revival have finally brought some historical justice to a figure who must surely be regarded as one of the greatest and most humane biologists of all time.

### References

- Brackman A C 1980 *A Delicate Arrangement: The Strange Case of Charles Darwin and Alfred Russel Wallace* (New York: New York Times Books)
- Brooks J L 1984 *Just Before the Origin: Alfred Russel Wallace's Theory of Evolution* (New York: Columbia University Press)
- Dickerson R E 1928 *Distribution of Life in the Philippines* (Philippine Bureau of Sciences Monographs 21)
- George W 1964 *Biologist Philosopher: A Study of the Life and Writings of Alfred Russel Wallace* (London: Abelard-Schuman)
- George W 1981 'Wallace and His Line'; in *Wallace's Line and Plate Tectonics* (ed.) T C Whitmore (Oxford: Clarendon Press) pp 3–8
- McKinney H L 1972 *Wallace and Natural Selection* (New Haven: Yale University Press)
- Quammen D 1996 *The Song of the Dodo: Island Biogeography in the Age of Extinctions* (New York: Scribner)
- Severin T 1997 *The Spice Islands Voyage: In Search of Wallace* (London: Little, Brown and Company)
- Wallace A R 1855 *On the Law which has Regulated the Introduction of New Species* *Annals and Magazine of Natural History*. Reprinted in Brackman (1980)
- Wallace A R 1858 *On the Tendency of Varieties to Depart Indefinitely from the Original Type* *Proceedings of the Linnean Society*. Reprinted in Brackman (1980)
- Wallace A R 1860 Letter from Mr Wallace concerning the geographical distribution of birds; *Ibis* 1 449–454
- Wallace A R 1863 On the Physical Geography of the Malay Archipelago; *J. R. Geogr. Soc.* 33 217–234
- Wallace A R 1869 *The Malay Archipelago: The Land of the Orang-Utan and the Bird of Paradise* (London: Macmillan)
- Wallace A R 1880 *Island Life* (London: Macmillan)
- Wallace A R 1889 *Darwinism: An Exposition of the Theory of Natural Selection, with Some of Its Applications* (London: Macmillan)
- Wallace A R 1898 *The Wonderful Century: Its Successes and Failures* (New York: Dod, Mead and Company)
- Wegener A 1924 *The Origin of Continent and Oceans* 3rd edition (London: Methuen)