

Feature: Wallace centennial

Alfred Russel Wallace — natural selection, socialism, and spiritualism

Alfred Russel Wallace, who died 100 years ago, on November 7 1913, is most often remembered as a kind of ‘Darwin satellite’: the other discoverer of evolution by natural selection. He was, however, a scientific superstar in his own right. In this feature, **Andrew Berry** examines Wallace’s life. In the following three pieces, Wallace scholar **James Costa**, Darwin biographer **Janet Browne** and literary critic **James Wood** look at different aspects of Wallace’s complex legacy.

Writing in 1863, Thomas Henry Huxley, never one to bestow praise lightly, was impressed by the combination of detailed observation and grand, synthetic theory that flowed from Wallace’s 12 years in the field, four in the Amazon, and eight among the islands of Southeast Asia: “Once in a generation, a Wallace may be found physically, mentally and morally qualified to wander unscathed through the tropical wilds of America and of Asia; to form magnificent collections as he wanders; and withal to think out sagaciously the conclusions suggested by his collections” [1].

Wallace was the eighth of nine children in a middle-class family of dwindling means. He was born in 1823 in Usk, Monmouthshire, where the family had moved in pursuit of a “place where living was as cheap as possible” [2], but from the age of five was raised in Hertford. After receiving the rudiments of an education at Hertford Grammar School, family financial failings forced his withdrawal at 13, and Wallace soon found himself assisting in his older brother’s surveying business. Significantly, during this period, Wallace was exposed for the first time to radical strands of early socialist thought in Working Men’s and Mechanics’ Institutes. The result was a lifelong sympathy for (and empathy with) the underdog. Wallace’s scientific education was proceeding in parallel: tramping with surveying pole in hand across the English countryside sparked an interest in natural history, which blossomed under the tutelage of fellow youthful self-educated naturalist, H.W. Bates, future discoverer of Batesian mimicry. Wallace and Bates became enthusiastic beetle collectors, but they had ambitions beyond Britain.

Inspired by the scientific travel accounts of Alexander von Humboldt and Charles Darwin, and by the

anonymous evolutionary speculations of Robert Chambers in *The Vestiges of the Natural History of Creation* (1844), they decided to head to the tropics to make their names as scientists. They would make their own collections with an eye to contributing scientifically, and would sell duplicate specimens via a London agent to fund the enterprise. In 1848, they headed to Brazil. After initially working together, they went their separate ways: Bates would spend eleven years there, Wallace four. Wallace focused on the unexplored upper reaches of the Rio Negro, returning downriver in 1852 with a treasure trove of species new to science as well as live animals — monkeys, parrots, a toucan — that would surely make his name in London. Wallace’s visions of a triumphant return were however cruelly annihilated when his ship caught fire in the middle of the Atlantic. Wallace, the only passenger, and the ship’s crew were rescued after drifting for ten days in open boats. Save for a small case of drawings and notes, he lost everything.

Wallace would have to do it all over again. In 1854, he headed to Singapore for eight years of exploration through the islands of Southeast Asia. This journey was in Wallace’s own assessment “the central and controlling incident” of his life [2]. The scientific riches he sent back were impressive. Let’s take birds as an example. In 1865, he reports a total of “212 new species collected by me in the islands of the Malay archipelago” [3]. Birds are a relatively conspicuous group, so the probability of finding new species is lower in birds than, say, weevils. The rate of discovery of new bird species thus gives a lower bound for Wallace’s efficacy as a collector. It is then amazing that, given that there are approximately 10,000 bird species, Wallace discovered 2% of all bird species during those eight years.

But Wallace’s travels are remembered not for their haul of new species, but for the over-arching scientific ideas that came out of them. What was subsequently dubbed ‘Wallace’s Line’ by T.H. Huxley — the biogeographic discontinuity between Asia and Australasia — was in fact a somewhat serendipitous discovery. Having in 1856 just missed a boat from Singapore to Makassar, Sulawesi, Wallace was forced to take a detour, via the islands of Bali and Lombok, and noticed the marked differences in the bird communities between these two neighbouring islands. Wallace would remain interested for the rest of his life in the interplay between adaptive and historical factors in determining the distribution of species. Here, his first-hand experience of both the New and Old World tropics surely played a role: that these two regions had ostensibly



Standing tall: Alfred Russel Wallace in 1862 in Singapore at the end of his eight years in Southeast Asia. Accompanied by two prize specimens, living birds of paradise, he was about to head home to England to his new life as an acclaimed, extraordinarily productive, and often controversial man of science.



Scientific adventure: Wallace spent eight years exploring Southeast Asia, from Singapore to New Guinea. His journey was stunningly fruitful, resulting in a bonanza of species new to science, in the discovery of arguably the most important idea in all of biology, and in a wonderful book telling the action-packed tale, *The Malay Archipelago*. (Map from: *The Malay Archipelago*, Macmillan, 1869.)

similar climates but were inhabited by very different groups of organisms argued strongly for the importance of historical forces. The subtitle of his masterpiece *The Geographical Distribution of Animals* (1876) was “a study of the relations of living and extinct faunas as elucidating the past changes of the Earth’s surface.” In it, he argued that the distribution of species is jointly determined by earth history and by evolutionary history. In *Island Life* (1880), he called this the “complete interdependence of organic and inorganic nature” [4].

Wallace’s first evolutionary publication was the so-called ‘Sarawak Law’ (1855), named for the region of North Borneo where he wrote it, in which he laid out what Darwin would term the ‘descent with modification’ component of evolution: biological diversity bears the footprint of a genealogical process. Wallace emphasized his conclusion: “Every species has come into existence coincident both in space and time with a pre-existing closely allied species” [5]. He had recognized that closely allied species — today we call them closely related species — tend to cluster geographically, and, in the case of fossils, stratigraphically. A genealogical process, with ancestral species ultimately giving rise to relatively similar descendant ones, is the explanation of both patterns. The Sarawak paper, with its grand synthesis, was a major departure from the solidly empirical

natural history Wallace had hitherto published, and he looked forward to the controversy he expected it to stir up. But the paper seemed to have little impact. Darwin, in a letter, was supportive, “You say that you have been somewhat surprised at no notice having been taken of your paper in the *Annals*. I cannot say that I am; for so very few naturalists care for anything beyond the mere description of species” [6].

That Darwin, one of Wallace’s heroes, was clearly both sympathetic to Wallace and interested in what he was doing perhaps explains why Wallace chose to send his next theoretical insight to Darwin rather than directly to a journal. During a fit of malarial fever while in the Moluccan Islands, Wallace glimpsed what Darwin would call “natural selection”. The result was the so-called ‘Ternate paper’ (because Wallace sent it from the island of Ternate), which, when it arrived at Darwin’s Down House on 18 June 1858, would send Darwin in to a tailspin. Writing to his friend, the geologist Charles Lyell, Darwin mourned his loss of priority, “So all my originality, whatever it may amount to, will be smashed” [7], but he was also determined to do the right thing by his unanticipated rival, “I would far rather burn my whole book than that he [Wallace] or any man shd [sic] think that I had behaved in a paltry spirit” [8]. Lyell and the botanist Joseph Hooker, another of Darwin’s confidants, contrived an arrangement

they hoped would both preserve Darwin’s precedence and give Wallace appropriate credit: they presented a double announcement of the theory — one by Darwin, one by Wallace — at the July 1 1858 meeting of the Linnean Society. Historians of science have debated the propriety of this arrangement — most scientists would surely object to finding themselves second author in a joint publication after sending a manuscript to a colleague — but the fact is that Wallace was thrilled. His newfound prominence alongside Darwin catapulted him from the obscurity of being a professional collector to membership of the scientific elite. Writing to his mother on hearing the news, he exalted in the prospect of “the acquaintance and assistance of those eminent men on my return home” [9].

In 1862, Wallace returned to England, this time without mishap, to find himself both wealthy and acclaimed for his science and for his exploration. His specimens had sold well — for example, seven months in the Aru Islands off the western tip of New Guinea had yielded £1,000 — and his agent had invested the proceeds astutely. Wallace plunged in to London scientific life, working up his collections for publication and writing on a range of issues, including human evolution, a topic that Darwin had deemed too inflammatory for *On the Origin of Species*.

However, neither Wallace’s wealth nor his scientific focus was to last. He had a

facility for losing money and was soon struggling to make ends meet. That, for many years, he was dependent on the income derived from marking exams is surely a clear indicator of financial desperation. Hearing of Wallace's plight in 1881, Darwin organized a government pension of £200 per annum, thereby providing the kind of financial security that Wallace himself was apparently incapable of generating.

Wallace's scientific focus found competition when, in 1865, he went to his first séance. He became a convinced spiritualist and, within a year, was publishing on the subject. In 1869, for the first time in print, his scientific and non-scientific views collided: in a review of the latest edition of Lyell's *Principles of Geology*, Wallace announced that natural selection alone was not sufficient to account for human evolution. As a spiritualist, he believed that humans have non-material spirits — implying supernatural involvement — but he had scientific reasons as well. Our brains, he claimed, are over-engineered: through the people he met on his travels, he recognized that even the 'savage' in his mud

hut has the potential to play Chopin études on the piano, despite the fact that he will never even see a piano. How could natural selection, which Wallace appreciated only responds to immediate needs, produce apparently useless traits like these? The solution to this question was, for Wallace, some kind of teleological non-material guiding force.

Wallace continued to contribute scientifically, but he was becoming increasingly engaged in non-scientific activities, with his spiritualism, for example, spawning the book *Miracles and Modern Spiritualism* (1875). Wallace saw spiritualism as a legitimate domain of scientific enquiry, explaining in 1873 in a letter to *The Times* that "it is my firm and deliberate belief that every branch of philosophy must suffer till they [spiritual forces] are honestly and seriously investigated, and dealt with as constituting an essential portion of the phenomena of human nature" [10]. He made multiple attempts to recruit his fellow scientists to this cause of spiritualism as science and was duly rebuffed. Huxley was especially eloquent: "I am neither shocked nor disposed to issue a Commission of Lunacy against you. It may be all true, for anything I know to the contrary, but really I cannot get up any interest in the subject. I never cared for gossip in my life, and disembodied gossip, such as these worthy ghosts supply their friends with, is not more interesting to me than any other. As for investigating the matter, I have half-a-dozen investigations of infinitely greater interest to me to which any spare time I may have will be devoted. I give it up for the same reason I abstain from chess — it's too amusing to be fair work, and too hard work to be amusing." [9]

The philosopher and economist John Stuart Mill was indirectly responsible for promoting what was to become Wallace's other major non-scientific preoccupation, socialism. In the final pages of *The Malay Archipelago*, his travelogue about his Southeast Asian journeys, Wallace excoriated Victorian society as being "in a state of barbarism" with regard to "social and moral organization" [11]. Industrial Britain's social failings — its disparities, poverty, injustices — were put in to stark relief by the egalitarian structure of many of the indigenous communities Wallace had visited. Mill suggested that Wallace become involved in the movement to reform land tenure



Hornbill medley: Wallace was keen to learn more about these peculiar birds while in Southeast Asia. In Sumatra, he encountered a juvenile extracted from its tree-hole nest, and recorded his surprise in *The Malay Archipelago*: "It was exceedingly plump and soft, and with a semi-transparent skin, so that it looked more like a bag of jelly, with head and feet stuck on, than like a real bird." (From Wallace, A.R. (1863). *The Bucerotidæ, or Hornbills*. *Intellectual Observer* 3, 309–317. Scan courtesy of Charles H. Smith.)



Paradise's treasures: The ultimate goal of Wallace's Southeast Asian travels was New Guinea. In a figure from his great work on biogeography, *The Geographical Distribution of Animals* (1876), Wallace has pictured several of New Guinea's most remarkable inhabitants, including a tree kangaroo, a twelve-wired bird of paradise, and a paradise kingfisher.

practice. Ultimately, in 1881, Wallace became the founding president of the Land Nationalization Society, which asserted that society's ills and inequities derived primarily from the private ownership of land.

Wallace was the prototype for the socially engaged scientist. He used his scientific preeminence as a springboard to dive in to a huge range of issues. He championed votes for women; he was concerned that the medical profession was covering up the dangers inherent to smallpox vaccination; he developed ideas for the reform of the House of Lords and of the Church of England; he presaged 'green belts' of countryside around urban centres; he was a defender of free access to common land (and a critic of the insatiable appetite for land of both grouse shooters and golfers); he was passionate about the best ways to educate the public about scientific issues; he condemned the accumulation of great wealth by individuals, especially if their fortunes were derived from speculation on the



Fit for a Rajah: While in Sarawak, North Borneo, Wallace was the guest of Sir James Brooke, the English adventurer who governed Sarawak as his own personal fiefdom. Wallace named a newly discovered butterfly in Brooke's honor, *Ornithoptera Brookiana* (currently *Trogonoptera brookiana*), noting in *The Malay Archipelago* that this is "one of the most elegant species known". (Image courtesy of Museum of Comparative Zoology, Harvard University.)

stock exchange; he argued against globalised free trade; an anti-imperialist, he preached "the rights of every people to govern themselves" [12].

The contrast with Darwin is striking. After publication of *The Origin*, Darwin's strategy was to consolidate and concretise the arguments laid out in his seminal work. His output remained resolutely scientific. One of the many reasons that Wallace has been so comprehensively eclipsed by Darwin in the standard telling of the evolution story may be that we prefer our scientists to stick to science. There is something laudably dedicated, almost puritanical, about Darwin's single-minded devotion to his scientific cause, whereas Wallace's scattershot embrace of every needy underdog under the sun smacks of dilettantism. We cringe at Wallace's more unfortunate choices — his endorsement of phrenology as "the true science of mind" [13], for instance — and wish he had followed Darwin's lead in staying true to science. But this may be the wrong reaction. Now, more than ever, we need scientists willing to become engaged in public ways with political and social issues. We need scientists willing to step outside the lab to talk about GMOs and about climate change; these topics are too important to be left in the hands of activists and politicians. Wallace was a brilliant scientist and,

also, a passionate and engaged public intellectual. May he be a role model and an inspiration — perhaps one stripped of that enthusiasm for phrenology — for generations of scientists to come.

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Wallace on the evolutionary trail

James T. Costa

When Alfred Russel Wallace described himself late in life as a "red-hot radical" he was referring to his campaigns as social reformer. However, his most significant scientific contributions were equally radical in their day, none more so than his early embrace of 'transmutation' (evolution, in modern terms). Wallace's eight years of travels in Southeast Asia (1854–1862) yielded an unprecedented bounty of specimens (with many species new to science) and detailed zoological, geographical, and ethnological observations recorded in a series of notebooks and journals. These provided rich source material for many of the approximately 60 papers and letters that Wallace published from the field in that period, as well as some of Wallace's most important later works, such as *The Malay Archipelago* [1] and *The Geographical Distribution of Animals* [2]. Several of Wallace's papers explore topics related to his overriding interest in the 'species question' — the nature of species and varieties, and the idea of transmutation. Understanding the origin of species and varieties was one of the main motivators for Wallace's travels in South America and Southeast Asia (e.g., Wallace Correspondence Project [3], letters WCP345, WCP346, WCP348). One notebook from this period in particular stands out in articulating his interest far more explicitly than the circumspect language found in most of his published writings.

Linnean Society of London manuscript No. 180, labeled the 'Species Notebook' by the late historian of science H. Lewis McKinney [4], spans the years 1855 to about 1860. Recently published for the first time in facsimile with transcription and commentary [5], this notebook is remarkable for its extensive narrative in which Wallace recorded evidence and constructed arguments for transmutation, aiming at the same time to demolish the leading anti-transmutation arguments of the day, put forward by geologist Charles Lyell in his seminal *Principles of Geology* [6]. Lyell, the preeminent naturalist of Britain, devoted much of the second volume of the *Principles* to undermining the idea of species change, and his anti-transmutation