

On the Organic Law of Change

Alfred Russel Wallace and the book that should have been

There sits on a shelf in central London a worn and modest marbled-board notebook. Its ordinariness belies its contents – a sketch of an evolutionary manifesto intended to revolutionise our understanding of life. This notebook records the earliest views on ‘transmutation’ (as evolution was then called) by the naturalist Alfred Russel Wallace (1823–1913), who was to nearly scoop Darwin and become one of the most famous scientists of his day. Author **James T Costa** reveals the notebook’s contents.



Ornithoptera crassus
Male
Batachian

Wallace’s pluck, perseverance, creativity and genius make him the quintessential nineteenth-century naturalist-explorer, and this field notebook – simultaneously journal and day book, travelogue and diary – is packed with arguments, speculations, schemes and natural history observations.

Designated manuscript 180 of the Linnean Society of London, the notebook’s quiet existence in Burlington House is a far cry from the huts, houses, steamships and sailboats in which it journeyed with Wallace, from Singapore and Sarawak to New Guinea and the Aru Islands, between 1854 and 1862. Having hop-scotched some 14,000 miles across the Malay Archipelago with the tides and currents and monsoon winds, one can almost fancy on this notebook the lingering scent of... what? Perhaps orang-utan, durian, arrack, the spice islands, sago cakes, gunpowder, camphor or the spray of the Coral Sea? It seems appropriate that so well-travelled a notebook should record thoughts just as vast: Wallace’s insights into the ‘mystery of mysteries’, as it was memorably described, the origin of species.

In the years leading up to Darwin’s publication of *On the Origin of Species*, Wallace was sketching in splendid isolation ideas for his own book on the subject. *The Origin*, in fact, is why Wallace’s planned manifesto, perhaps to have been entitled *On the Organic Law of Change*, never came to be. The revelation that he had hit upon the same idea as Darwin after sending the elder naturalist his manuscript from Ternate in early 1858, and the news that Darwin was already working towards a book on the subject, led Wallace to shelve his plan and defer to Darwin. There is no question of the

latter’s genius and long labour over the species question, and the two became friends. But Wallace’s modesty has led to an under-appreciation of his own talents, or worse, the notion that he was simply lucky, his discoveries accidental. Wallace’s species notebook is a corrective, revealing his plan and deep insight like no other document in those pre-*Origin* years.

WALLACE VOYAGING

Wallace did not travel to collect so much as he collected to travel, with proceeds from his specimen sales in London funding his explorations. Though a self-taught, working naturalist with little social standing, Wallace was a kindred spirit with the philosophical naturalists – interested in the big questions. His main object was species origins. From the moment he read the anonymous *Vestiges of the Natural History of Creation* in 1845, he was convinced of its transmutational vision. Species change, but how? And how to prove it? After four years exploring Amazonia he spent another eight in the East, publishing among some 60 papers and letter extracts two landmark evolutionary works. These were his 1855 *Sarawak Law* and the 1858 Ternate essay announcing his discovery of the mechanism of species change – natural selection. Where did he find the time and energy with his incessant travelling and collecting, not to mention documenting, preparing and shipping his prodigious collections? The specimens alone, his bread-and-butter, took enormous care – thousands of insects, plus the skins and skeletons of a zoo of birds, mammals, reptiles, amphibians and the odd fish. Then there was the endless battle with insect pests and scavengers seeking to eat his specimens.

Wallace wrote prolifically when his pace was slowed by infirmity or rain, the species notebook >

his constant companion. It would be remarkable even if it was limited to collecting adventures and natural history notes. Accounts of orang-utans, birds of paradise, bats filling the twilight sky and striking insects enliven his published works, especially his acclaimed memoir *The Malay Archipelago* (1869). Its evolutionary entries reveal Wallace the thinker, philosopher and discoverer. Attacks on the prevailing arguments of the day for benevolent design and harmony in nature, mix with discussions of island species, morphology, domestic varieties, fossils, embryology and instinct. But there is more – an extended argument for transmutation. The centrepiece of this is Wallace's long critique of Charles Lyell's anti-transmutationism in the *Principles of Geology* (1830–1833).

MR LYELL SAYS...

Charles Lyell was the pre-eminent geologist of Britain and his long attack on transmutation in the immensely successful *Principles* was viewed as the final word on the subject. Undermining the definitive arguments against species change was critical to paving the way to acceptance of the

proximate in space (geographical distribution) and time (the fossil record), suggesting that new species are derived from pre-existing ones.

Wallace knew just how to skewer Lyell's anti-transmutationism. Wallace not only argued for the progressive change of fossils over time, he also had a remarkably modern grasp of the idea of branching lineages. Lyell asserted that a fossil mammal found among Mesozoic reptiles dealt a fatal blow to the idea of a progressive succession of groups. Not so, says Wallace: 'all that is required for the progression is that some reptiles should appear before Mammalia & birds or even that they should appear together. In the same manner reptiles should not appear before fishes but it matters not how soon after them. Not one fact contradicts the progression', Wallace declares: 'each group goes on progressing after other groups have branched from it. They then go on in parallel or diverging series...' In modern terms, this is evolutionary-tree thinking.

The significance of unique species of remote islands was equally clear to Wallace. He noted from Darwin's *Journal of Researches* that the Galapagos Islands contain unique species found nowhere else,

In little more than a decade after setting out to solve the mystery of the origin of species, Wallace actually succeeded in his quest

revolutionary idea. Wallace copied out arguments from Lyell into his notebook and followed each with a response. Under one, 'Note for Organic law of change', Wallace wrote that 'the inorganic world is the result of a series of changes from the earliest periods produced by causes still acting', and so 'it would be most unphilosophical to conclude... that the organic world was subjected to other laws'. Following a similar comment he noted that he should 'introduce this and disprove all Lyell's arguments first at the commencement of my last chapter'. A 'last chapter' implies multiple chapters – his planned book.

This resonates with a comment made in a letter to his friend and earlier collecting companion Henry Walter Bates, who had written from Amazonia to compliment Wallace on his 1855 paper. Replying in December 1857 from the island of Ambon, Wallace wrote that he had 'prepared the plan & written portions of an extensive work embracing the subject in all its bearings & endeavouring to provide what in the paper I have only indicated'. He meant to rebut Lyell and build on the central argument of the 1855 paper – that related species tend to be

yet resemble those from the nearest mainland. He asks, 'if they are special creations why should they resemble those of the nearest land? Does not that fact point to an origin from that land?' He saw that unique island species descend from ancient colonists that arrived by chance from the nearest mainland, observing that this is why older islands have more unique species than younger ones – more time for colonisation and subsequent slow modification.

In a third line of attack Wallace tackled domestication. Several of Lyell's anti-transmutation arguments stemmed from the supposed limited variability of domestic breeds. Species can vary only so much, he maintained, as no domestic variety had been transmuted into a new species. Limited capacity for change was also indicated by the apparent tendency to revert to a more generalised parental type – like mutts produced by the crossing of distinct dog breeds run wild. Wallace first points to strikingly different dog varieties as themselves evidence for a great capacity for change: 'is not the change of one original animal to two such different animals as the Greyhound & the

bulldog a transmutation?' Moreover, he demands, 'what positive evidence have we that species only vary within certain limits?' He offered a thought experiment: imagine all dog breeds but one became extinct, and that remaining one was spread far and wide around the world and used to develop new breeds. Then suppose all of those breeds but one in turn became extinct, and repeat the process. 'Does it not seem probable that again new varieties would be produced', asks Wallace, 'and have we any evidence to show that... a check would be placed on any further change & ever after the species remain perfectly invariable?' He emphasised the change in species and varieties that can be realised over ages. Changes made 'artificially in short periods may have a tendency to revert to the parent stock... but when the Change has been produced by nature during a long series of generations, as gradual as the changes of Geology, it by no means follows that it may not be permanent & thus true species be produced'.

There are many other pro-transmutation arguments in the species notebook, and these are just as modern. Frustratingly, there are also gaps – nothing on the struggle for existence, or on his February 1858 discovery of natural selection, which came to him in a flash of insight in a fevered state. Upon recovery, Wallace wrote out and posted the essay at Ternate to Darwin, fatefully asking him to pass it on to Lyell, and was then off to New Guinea for several months. Back in Ternate the following August he received word of the dramatic effect of his essay in faraway England – the reading hastily arranged by Lyell and Hooker at the Linnean Society on 1 July, along with Darwin's unpublished writings on the subject.

THE FORCE OF ADMIRATION

With the revelation of Darwin's earlier discovery of the mechanism of species change and progress toward a treatise on the subject, Wallace abandoned his book. Today Wallace and Darwin are the protagonists in this drama, with Lyell in a supporting role. Yet it was Lyell who was Wallace's inspiration and foil. *The Sarawak Law* and Ternate papers were aimed at Lyell, as his book would have been. Wallace would have pursued what nineteenth-century philosopher William Whewell termed a 'consilience' argument in his book, tying together many seemingly unrelated strands of evidence in support of transmutation, the strands combining to produce an evidentiary fabric of great strength. It is still a powerful way to argue. Significantly, *On the Origin of Species* was constructed along consilience lines.

Indeed, Wallace and Darwin's paths of discovery and explication of their ideas were more similar than has been realised. Receiving the *Origin* with Darwin's compliments while still in southeast Asia, Wallace lavished praise on the treatise in letters to friends and family, lauding its 'vast accumulation of evidence', 'overwhelming argument' and 'admirable

tone and spirit'. He enthused in one letter that 'the force of admiration can no further go!!!' The species notebook reveals a Wallace about whom the same can be said – the force of our admiration can no further go, seeing through the lens of this much-travelled notebook, Wallace's tenacity, creativity and impressively deep insight into the then-revolutionary idea of species change. This notebook underscores Wallace's great stature as co-founder with Darwin of modern evolutionary biology.

By the end of his long life Wallace had authored hundreds of papers and some 22 books, several of which have never been out of print. He was also showered with honours and awards, including the Order of Merit, the greatest civilian honour bestowed by the British crown. Wallace's species notebook passed to his son William, who in turn presented it to the Linnean Society in 1936. And there it sits on a panelled shelf, a portal to a lost time and place. A remarkable record of the thinking of a remarkable naturalist and his plans for a remarkable book that should have been.

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To mark the centennial of Wallace's death, Harvard University Press offers an elegant edition of Alfred Russel Wallace's species notebook. Presented in facsimile with text transcription and annotations by James T Costa, this never-before-published document provides a new window on Wallace's travels, trials and genius.

Available from the Museum shop, priced £36.95 or online from Harvard University Press at www.hup.harvard.edu from late November 2013.

