

ALFRED RUSSEL WALLACE'S UNREALIZED LAST BOOK:  
INSIGHTS FROM THE PLAN FOR *DARWIN AND WALLACE*

by

JAMES T. COSTA<sup>1,\*</sup> AND GEORGE BECCALONI<sup>2,†</sup><sup>1</sup>*Highlands Biological Station, Western Carolina University,  
256 N. Sixth Street, Highlands, North Carolina, USA*<sup>2</sup>*Wallace Correspondence Project, Buckhurst Hill, Essex, UK*

In honour of the two hundredth birthday of naturalist Alfred Russel Wallace (1823–1913) we present a transcription and analysis of the plan for Wallace's unrealized final book. Recently come to light, *Darwin and Wallace* was to have been a volume of eight chapters published by the well-known London publishing house of John Murray in the spring of 1915, a project derailed by Wallace's death at the age of 90 in November 1913. Drawing on letters, manuscripts and contemporary published works, we show how the chapter outlines illuminate Wallace's late-life thinking about his and Darwin's working methods, the factors contributing to their independent discovery of natural selection and contemporary challenges to Darwin–Wallace evolutionary gradualism and natural selection by the neo-Lamarckian, mutationist and early Mendelian schools during the period dubbed the 'eclipse of Darwinism'. Wallace's planned book provides insight into how the co-founder of modern evolutionary biology saw his legacy in relation to Darwin's, and his role as fierce and eloquent defender of his and Darwin's theory during a fascinating period in the history of evolutionary biology. In the emergence of neo-Darwinism in the 'Modern Synthesis' period, Wallace's contributions were largely omitted, an oversight that *Darwin and Wallace* may have prevented had it been realized.

**Keywords:** natural selection; eclipse of Darwinism; Mendelism;  
mutationism; neo-Lamarckism; neo-Darwinism; Modern Synthesis

## INTRODUCTION

The celebrated nineteenth-century English naturalist Alfred Russel Wallace (1823–1913) is best known today as the co-discoverer with Charles Darwin of the principle of natural selection, and as the founder of the field of evolutionary biogeography. He is also

\*costa@email.wcu.edu

†g.beccaloni@wallaceletters.org

renowned as an astonishingly prolific collector and theorizer whose voluminous papers and books include landmark scientific works and the acclaimed travel memoir *The Malay archipelago* (1869), as well as extensive social, philosophical and ethical commentaries. By the end of his long life at age 90 in 1913, Wallace was feted as the 'Grand Old Man' of science, author of some 23 books and hundreds of papers, essays, published letters and interviews.<sup>1</sup> Wallace's accomplishments are all the more remarkable given the modest financial and social circumstances of his youth and early adulthood. His formal education ended at age 14 when family finances compelled him to find a job. He alternately worked for varying periods as apprentice clockmaker, builder, land surveyor and teacher until he travelled to the Amazon in 1848. As a teenager and young adult the autodidact Wallace availed himself of public and mechanics' institute libraries and lectures, reading widely, including travel narratives such as those of Humboldt and Darwin and works of natural philosophy such as Lyell's *Principles of geology* and Lindley's *Elements of botany*. He became interested in natural history and plant collecting when he and his brother moved to Neath, in Wales, in 1841.

The year that Wallace taught in Leicester (1844) led to a fortuitous friendship with Henry Walter Bates (1825–1892), a kindred spirit who introduced Wallace to the joys of insect collecting and shared his enthusiasm for natural history and natural philosophy. Returning to surveying after the death of his brother William in 1845, Wallace and Bates continued corresponding, discussing collecting, scientific ideas and, crucially, an eventual plan to travel abroad to collect and explore. They would pay their way through the sale of their duplicate specimens back in London while pursuing some of the most significant scientific questions of the day pertaining to diversity, geographical distribution and the nature and origin of varieties and species. Remarkably, the two managed to realize this plan, securing the offices of an agent in London and arriving in Amazonia in April 1848, where Wallace was to spend the next four years and Bates the next 11. The tragic loss of nearly two years of collections and notebooks, when Wallace's ship burned in mid Atlantic en route home in 1852, may have compelled him to undertake a second voyage, this time with a young assistant. They departed in 1854 for the Malay archipelago, where Wallace continued to support his scientific pursuits through sale of his duplicate natural history specimens.

It was in the Malay archipelago that Wallace's evolutionary thinking came to fruition. Soon after his arrival, while residing in Sarawak, Borneo, he penned what is now known as the 'Sarawak Law' paper, arguing that species always arise coincident in space and time with a pre-existing and closely related species, giving rise to a branching tree-like pattern of species relationships over time. How exactly new species so arose Wallace did not know, but this was one of the objects of his investigations. At the same time he documented in a private notebook his eclectic reading and the outline for a book arguing in favour of the transmutation theory, to be structured around the series of anti-transmutation arguments put forth by Charles Lyell in *Principles of geology*. In this notebook Wallace wrote out each of Lyell's arguments followed by a rebuttal, referring to chapter structure in places. Wallace scholar H. Lewis McKinney suggested that Wallace's planned book might have

1 One prominent obituary of Wallace was headlined 'Grand Old Man of Science Dead', reporting: 'Science has lost its "grand old man"'. Dr. Alfred Russel Wallace, the greatest of all modern scientists—co-originator with Charles Darwin of the theory of natural selection—died yesterday at his home in Wimborne, Dorset ...', *Daily Mirror* (London), 8 November 1913, p. 4d.

been called ‘On the organic law of change’, the title Wallace used to head the section of the notebook dedicated to his pro-transmutation book project.<sup>2</sup> This book was never realized, however.

In 1858 Wallace famously hit upon the mechanism behind species change while prostrated with malaria on the island of Gilolo (Halmahera Island, Indonesia), penning his essay ‘On the tendency of varieties to depart indefinitely from the parental type’ and sending Darwin a fair copy from his base in nearby Ternate soon after, in March of that year. Wallace’s essay, written with Lyell’s anti-transmutationism as his target, detailed a process nearly identical to that developed by Darwin 20 years earlier, which the elder naturalist had dubbed ‘natural selection’. Receipt of Wallace’s essay precipitated a crisis over priority for Darwin, a problem resolved by his friends Joseph Hooker and Charles Lyell, who hastily arranged for excerpts of Darwin’s unpublished writings on the subject to be read with Wallace’s essay at a special meeting of the Linnean Society of London on 1 July 1858. Soon afterward, perhaps to underscore his priority, Darwin sent Wallace an outline of the table of contents of his planned ‘big species book’, to be titled *Natural selection*, which Wallace copied out in his notebook.<sup>3</sup> Abandoning the longer book in favour of a smaller volume (Darwin called it an abstract) that could be completed more quickly, Darwin published *On the origin of species* in November of 1859, just a year and four months after the Linnean Society papers were read.<sup>4</sup> Wallace, still in the Malay archipelago, received one of the first copies and was unequivocal both in his praise of the book and in his deference to Darwin as the originator of the theory of species change by natural selection.<sup>5</sup> Perhaps it was for these reasons, a combination of deference to Darwin’s priority and admiration for his accomplishment, that Wallace abandoned his own planned book, ‘On the organic law of change’.

Wallace returned to Britain in 1862. In the ensuing years, while he famously disagreed with Darwin over several aspects of the evolutionary process, including the evolution of human cognition, sexual selection and reinforcement in speciation, the two were friendly and Wallace became a fierce defender of Darwinism, surely as effective as ‘Darwin’s bulldog’ Thomas Henry Huxley.<sup>6</sup> It is noteworthy that on those questions where Wallace differed from Darwin, his position was typically based on a strong and unwavering commitment to natural selection as the most important, if not sole, mechanism of

2 Alfred Russel Wallace, ‘Species notebook’ (Linnean Society of London MS-180), pp. 34–53. See J. T. Costa, *On the organic law of change: a facsimile edition and annotated transcription of Alfred Russel Wallace’s species notebook of 1855–1859* (Harvard University Press, Cambridge, MA, 2013), pp. 96–134; Wallace’s planned book is discussed in J. T. Costa, ‘Engaging with Lyell: Alfred Russel Wallace’s Sarawak Law and Ternate papers as reactions to Charles Lyell’s *Principles of geology*’, *Theory Biosci.* **132**(4), 225–237 (2013), and *Wallace, Darwin, and the origin of species* (Harvard University Press, Cambridge, MA, 2014).

3 Wallace, *op. cit.* (note 2), p. 14 verso; J. T. Costa, *On the organic law of change*, *op. cit.* (note 2), pp. 430–431.

4 C. R. Darwin, *On the origin of species* (John Murray, London, 1859).

5 Wallace’s first reactions upon reading *On the origin of species* are found, for example, in letters to two friends: ‘Mr. Darwin has created a new science & a new Philosophy, and I believe that never has such a complete illustration of a new branch of human knowledge, been due to the labours & researches of a single man ...’, Wallace to H. W. Bates, 24 December 1860, Wallace Correspondence Project, ‘Letter no. WCP374’, <https://epsilon.ac.uk/view/wallace/letters/WCP374> (accessed 20 December 2022); and ‘It is the “Principia” of Natural History. It will live as long as the “Principia” of Newton ... Mr. Darwin has given the world a new science & his name should in my opinion stand above that of every philosopher of ancient or modern times. The force of admiration can no further go!!!’, Wallace to G. Silk, 1 September 1860 and 2 January 1861, Wallace Correspondence Project, ‘Letter no. WCP373’, <https://epsilon.ac.uk/view/wallace/letters/WCP373> (accessed 20 December 2022).

6 Wallace’s very first public defence of Darwinism came less than a year after his return to Britain: A. R. Wallace, ‘Remarks on the Rev. S. Haughton’s paper on the bee’s cell, and on the origin of species’, *Ann. Mag. Nat. Hist.* **12**(3rd ser.): 303–309 (1863).

evolutionary change; indeed, Wallace described himself as ‘more Darwinian than Darwin’ in his dedication to natural selection.<sup>7</sup> This is evident in his role as the ‘first Darwinian’ and defender of his and Darwin’s theory even late in life. For example, in the years following Darwin’s death in 1882, one of his acolytes, George John Romanes, declared that natural selection as commonly conceived could not account for the origin of new species, advocating instead for a mechanism he dubbed ‘physiological selection’, which might best be described in modern terms as a kind of higher-level selection. In a lengthy critical review,<sup>8</sup> Wallace exposed the logical flaws, assumptions and lack of supporting data for Romanes’ theory, offering instead a model of incremental reinforcement of assortative mating by natural selection in the speciation process, a mechanism widely accepted today.

Wallace’s unwavering defence of Darwin and Darwinism continued into the new century, through an exciting time in the history of evolutionary biology and genetics with such milestones as August Weismann’s germ-plasm theory, the connection between chromosomes and heredity and the rediscovery of Gregor Mendel’s work in 1900. It was also, however, a time when Darwinism was under siege, the beginning of the ‘eclipse of Darwinism’ as competing schools of thought purported to better explain the evolutionary process.<sup>9</sup> These included the early neo-Lamarckian, mutationist and Mendelian schools. It is perhaps unsurprising that Wallace felt compelled to rise to the defence of Darwinism in the face of these new challenges to natural selection and Darwinian–Wallacean gradualism, just as he had with Romanes’ ‘physiological selection’. It is in this context that Wallace conceived of a book he entitled *Darwin and Wallace*, to be written by his admirer James Marchant with Wallace’s assistance. Like ‘On the organic law of change’, however, *Darwin and Wallace* was not to be realized, as Wallace’s death on 7 November 1913 derailed the plan.<sup>10</sup>

The plan of Wallace’s final book project survives, and illuminates Wallace’s thinking about his and Darwin’s joint discovery and contemporary challenges to natural selection. Here we present a transcription and brief analysis of Wallace’s plan for *Darwin and Wallace*. The book was to open with a comparative analysis of the life and thought of the two naturalists, underscoring commonalities and differences in their respective intellectual trajectories and other factors contributing to their mutual discovery of evolution by natural selection, as well as their literary and scientific writings. More substantively, however, the book was to serve as a vehicle for critiquing then contemporary, early twentieth-century challenges to Darwinism, as well as to

7 Of his defence of natural selection, Wallace wrote: ‘Hence it is that some of my critics declare that I am more Darwinian than Darwin himself, and in this, I admit, they are not far wrong.’ A. R. Wallace, *My life: a record of events and opinions* (Chapman & Hall, London, 1905), vol. 2, p. 22.

8 A. R. Wallace, ‘Romanes versus Darwin: an episode in the history of the evolution theory’, *Fortnightly Rev.* **40**(n. ser.), 300–316 (1886).

9 The phrase ‘Eclipse of Darwinism’ originated with Julian Huxley (*Evolution: the modern synthesis* (George Allen & Unwin Ltd, London, 1942, pp. 22–28) and was popularized by Peter J. Bowler, *The eclipse of Darwinism: anti-Darwinian evolution theories in the decades around 1900* (Johns Hopkins University Press, Baltimore, 1983); see also Peter J. Bowler, ‘Revisiting the eclipse of Darwinism’, *J. Hist. Biol.* **38**, 19–32 (2005), and Mark A. Largent, ‘The so-called eclipse of Darwinism’, *Trans. Am. Phil. Soc.* **99**(1) (n. ser.), *Descended from Darwin: insights into the history of evolutionary studies, 1900–1970*, pp. 3–21 (2009).

10 It appears that Wallace left at least one other book unrealized at the time of his death, tentatively entitled ‘The awakening of labour’. The book was listed as a forthcoming work in a number of publishing trade magazines in 1913 and 1914. For example, the 13 February 1914 number of the *English Mechanic & World of Science* (vol. 98, p. 11) reported: ‘Dr. Alfred Russel Wallace, in addition to assisting the Rev. James Marchant with the critical study of “Darwin and Wallace” (Murray), and writing his booklet on “The Revolt of Democracy” (Cassell), already announced in these columns, is represented in Mr. Fisher Unwin’s new list with a study of “The Awakening of Labour”, in which the author is to outline his scheme of social and economic reconstruction “that shall raise the reward of labour, while increasing the total prosperity of the country”.’ See also Wallace Correspondence Project letters WCP3031, WCP3966, WCP6564 and WCP6567 at <https://epsilon.ac.uk/search?sort=date&f1-author=Wallace%2C%20Alfred%20Russel>.

reassert Wallace's independent role in the discovery of natural selection, something he had previously tended to downplay as he took a back seat to his friend Darwin, whom he admired greatly.

#### WALLACE'S BOOK PLAN COMES TO LIGHT

In early 2016 a collection of 31 letters<sup>11</sup> written to Revd Sir James Marchant (1867–1956) (27 by Wallace and four by his son William), plus Wallace's handwritten outline of *Darwin and Wallace*,<sup>12</sup> a typed transcript of the outline,<sup>13</sup> a printed advertisement for the book<sup>14</sup> (figure 1) and a few other documents, was listed for sale by bookseller Sophie Dupré Autographs (Calne, UK). Ten of the letters (from Wallace to Marchant) relate to the proposed book.<sup>15</sup> The collection subsequently passed through other dealers, and was split up and sold to a number of collectors around the world.

What was known about the planned book prior to this was an advertisement in The National Archives, UK (identical to the one in the above-mentioned collection), a three-page typed agreement for the book made between Marchant, Wallace and the publisher, John Murray, in the Natural History Museum, London,<sup>16</sup> and the following brief mention of the book by Marchant in his 1916 book *Alfred Russel Wallace: letters and reminiscences*:

It may be stated here that Wallace had suggested to the present writer that he should undertake a new work, to be called 'Darwin and Wallace', which was to have been a comparative study of their literary and scientific writings, with an estimate of the present position of the theory of Natural Selection as an adequate explanation of the process of organic evolution. Wallace had promised to give as much assistance as possible in selecting the material without which the task on such a scale would obviously have been impossible. Alas! soon after the agreement with the publishers was signed and in the very month that the plan of the work was to have been shown to Wallace, his hand was unexpectedly stilled in death; and the book remains unwritten.<sup>17</sup>

#### DARWIN AND WALLACE: TRANSCRIPTION AND ANALYSIS

We here offer a transcription of the *Darwin and Wallace* book plan together with analysis of the contents of each chapter as suggested by Wallace. We flesh out chapter contents

11 WCP6553–WCP6583 at <https://epsilon.ac.uk/search?sort=date&f1-author=Wallace%2C%20Alfred%20Russel>.

12 WCP6576.8402. This manuscript was sent as an enclosure in a letter dated 24 March 1913 from Wallace to J. Marchant (Wallace Correspondence Project, 'Letter no. WCP6576', <https://epsilon.ac.uk/view/wallace/letters/WCP6576>, accessed 20 December 2022). It is currently owned by Mr. Lars Fjeldsoe-Nielsen.

13 MS WCP6576.8403 (enclosure to WCP6576). This was probably typed by Marchant and sent to the publisher John Murray. Wallace Correspondence Project, 'MS no. WCP6576.8403', <https://epsilon.ac.uk/view/wallace/letters/WCP6576> (accessed 20 December 2022).

14 WCP5589.7773 (enclosure to WCP5589). This is printed on thin card and was probably sent to prospective buyers in 1913, before Wallace's death in November that year. It is currently owned by Mr. Lars Fjeldsoe-Nielsen. The only other known copy is in The National Archives, UK (Wallace Correspondence Project, 'MS no. WCP5589.7773', <https://epsilon.ac.uk/view/wallace/letters/WCP5589> (accessed 20 December 2022)).

15 These are, in date order: Wallace Correspondence Project letters WCP6576 (24 March 1913), WCP6575 (27 March 1913), WCP6574 (7 April 1913), WCP6573 (10 April 1913), WCP6583 (22 April 1913), WCP6567 (27 April 1913), WCP6566 (28 April 1913), WCP6564 (9 May 1913), WCP6562 (23 May 1913) and WCP6557 (1 September [1913]), at <https://epsilon.ac.uk/search?sort=date&f1-author=Wallace%2C%20Alfred%20Russel>.

16 John Murray to Wallace, 1 May 1913, Wallace Correspondence Project, 'Letter no. WCP7181', <https://epsilon.ac.uk/view/wallace/letters/WCP7181> (accessed 20 December 2022).

17 J. Marchant, *Alfred Russel Wallace: letters and reminiscences*, 2 vols (Harper & Brothers, New York and London, 1916), vol. 1, p. 3.

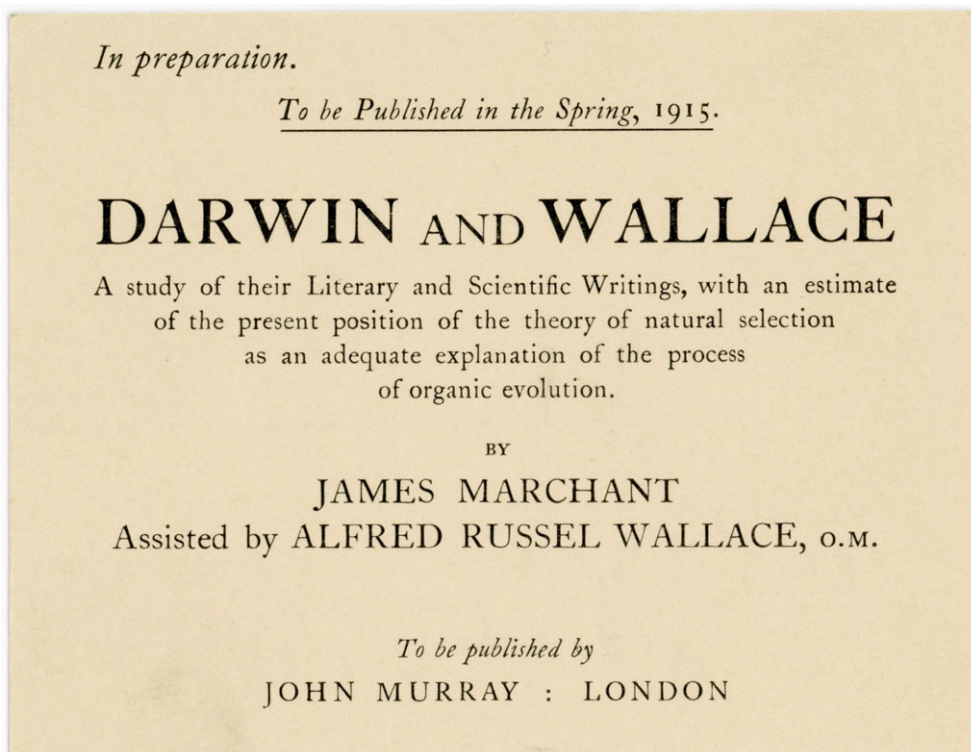


Figure 1. Advertisement for the planned volume *Darwin and Wallace* issued by the publisher, John Murray, London (WCP5589, MS enclosure; single 9 × 11.5 cm card); private collection.

and, where possible, provide background and context for the points Wallace wished to see discussed.

Notes for  
"Darwin and Wallace"  
by Revd. James Marchant  
assisted by  
A.R.W.

James Marchant was a British editor, author and social reformer. An admirer of Wallace's social thought and humanitarian interests, he commissioned Wallace to write the books *Social environment and moral progress* and *The revolt of democracy*, both published in 1913.<sup>18</sup> Marchant seems to have first corresponded with Wallace around 1897, and he authored the first book-length biography of him after Wallace's death.<sup>19</sup>

Marchant visited Wallace in the second half of March 1913, when he evidently expressed his desire to write a book about the life and work of Wallace and Darwin, an idea he may have

18 A. R. Wallace, *Social environment and moral progress* (Cassell & Co. Ltd, London, 1913) and *The revolt of democracy* (Cassell & Co. Ltd, London, 1913).

19 *Op. cit.* (note 17).

already discussed with publisher John Murray. It appears, however, that after their March meeting Marchant and Wallace were left with different ideas of the contents and arrangement of the book. When Wallace learned from Murray that Marchant had proposed a ‘double barrelled’ biography, an idea which neither he nor Murray favoured, Wallace instead suggested a considerably different, and more complex, format to Marchant. This explains Marchant’s remark that ‘It may be stated here that Wallace had suggested to the present writer that he should undertake a new work, to be called “Darwin and Wallace”’.<sup>20</sup> It was not the book he had envisaged, and Wallace had asserted his control over its production and contents. On 24 March 1913, Wallace wrote to Marchant:

After a few days thought, which I always find productive, and after writing to Mr Murray & finding that he had quite misunderstood your suggestion, which he thought was to be in the nature of a double barrelled ‘biography’ which he objected to as do I—I have sketched out the Title and Contents of Chapters of such a book as you spoke to me about, and which I think will not only be quite distinct from anything yet written on the subject, but if carefully and accurately written in a popular style, will be what the reading public of the present generation requires.

If you think it needs any modification I shall be glad to consider & discuss with you any suggestions you have to make. You can then take it to Mr. Murray & arrange with him the best size &c.

I should think there is matter enough for a volume of about 300 pages—or somewhere near 100,000 words. That will be easy for a ready writer like yourself, but it will want some reading up—especially for the last & most important Chapter, and for this, I can lend you, I think, all the books necessary.<sup>21</sup>

Wallace enclosed his proposed outline of the book in this letter. In his next letter to Marchant concerning the book, dated 27 March 1913, Wallace sought reassurance that Marchant’s writing would do the book justice:

Now for another and even more delicate question; as to the proposed ‘Darwin & Wallace’ book. What both I and Mr Murray feel is, that such a book, to succeed well, should have two qualities—(1) a thorough acquaintance with the whole matter treated, and (2) a bright & popular style. At present, neither Mr Murray nor myself have read any of your writings. Will you kindly send me a copy of what you consider your best written book. I hope it is that about Dr Barnado. As to the other quality—I really know no one who knows my own books so well as you do. But you would have to acquaint yourself as well with all Darwin’s works, and also with those of some of his more important Critics, especially of those of the ‘Mutationists’ & the ‘Mendelians’. Both difficulties I hope may be overcome, by associating my name in some way with yours, without my doing any of the actual writing. It may shorten & facilitate matters if you now see Mr Murray again, & show him the Outline of the subjects to be treated, with any suggestions of your own. Also show him this letter (the last part) and let him, if he thinks well of it, determine what the size of the book should be. Of course there must be the most complete openness between us three, and the name of ‘Murray’ as publisher is itself worth obtaining.<sup>22</sup>

20 *Op. cit.* (note 16).

21 Wallace to J. Marchant, 24 March 1913, Wallace Correspondence Project, ‘Letter no. WCP6576’, <https://epsilon.ac.uk/view/wallace/letters/WCP6576> (accessed 20 December 2022).

22 Wallace to J. Marchant, 27 March 1913, Wallace Correspondence Project, ‘Letter no. WCP6575’, <https://epsilon.ac.uk/view/wallace/letters/WCP6575> (accessed 20 December 2022; emphases are Wallace’s).

Marchant complied with Wallace's request, showing Wallace's proposed outline to Murray<sup>23</sup> and sending Wallace sample newspaper articles plus an article entitled 'A plea for regeneration' to serve as examples of his writing.<sup>24</sup> Wallace was satisfied: 'I have read your "Plea for Regeneration" and can see at once that you can write clearly, forcibly & imaginatively. The Press notices show the same.'<sup>25</sup>

Additional details about Wallace's arrangement with Marchant and Murray are given in follow-up correspondence. In a letter to Marchant on 10 April 1913, Wallace wrote: 'Re Murray, when you have made final arrangements with him, I thought of writing to him asking him to give me a Royalty of 5 per cent, for the use of my name & my cooperation and assistance as to the subjects included & the accuracy of the facts, leaving you a free hand in the actual writing & in the opinions you may express.' A month later Wallace thanked Marchant for a copy of the 'stamped Agreement', and said he would shortly be sending him a list of relevant papers.<sup>26</sup> The 'Agreement' is a copy of a typed document, signed by Murray and dated 1 May 1913, headed 'MEMORANDUM OF AGREEMENT between the Rev. James Marchant, Dr. Alfred Russel Wallace O.M. and Mr. John Murray for themselves and their respective executors administrators and assigns, with regard to the compilation and publication of a work at present entitled "Darwin and Wallace" ...'.<sup>27</sup> One of its sections states that 'Dr. Wallace agrees to assist Mr. Marchant in every way possible in the compilation of the work and to allow his name to appear with Mr. Marchant's on the title page'.

The last mention of *Darwin and Wallace* in the surviving correspondence was made by Wallace in a letter to Marchant dated 1 September 1913, little more than two months before the naturalist's death. Referring to the manuscript of the biographical chapter by Marchant, subsequently published in Wallace's book *The revolt of democracy*, Wallace wrote: 'It seems more suited to form a chapter of the Darwin & Wallace book. However it is certainly a very complete, accurate and appreciative sketch of my "Life" and on the whole the best that has yet appeared, and I sincerely thank you for the care with which you have written it and for the great amount of labour it must have cost you.'<sup>28</sup>

Title  
Darwin and Wallace:

A Study of their Literary and Scientific Writings, with an Estimate of the Present Position of the Theory of Natural Selection as an adequate explanation of the Process of Organic Evolution.

Unsurprisingly, Wallace put Darwin's name ahead of his own in the title. This is consistent with Wallace's long history of deferring to Darwin over priority for the principle of natural selection, and his oft-repeated praise of his colleague for not only coming to evolution by

23 The typed version of the outline (MS WCP6576.8403) may have been what Murray saw.

24 J. Marchant, 'A plea for regeneration', *Rep. 82nd Meeting Br. Assoc. Adv. Sci., Dundee, 1912*, 660–661 (1913).

25 Wallace to J. Marchant, 7 April 1913, Wallace Correspondence Project, 'Letter no. WCP6574', <https://epsilon.ac.uk/view/wallace/letters/WCP6574> (accessed 20 December 2022; emphases are Wallace's).

26 Wallace to J. Marchant, 10 April 1913, Wallace Correspondence Project, 'Letter no. WCP6573', <https://epsilon.ac.uk/view/wallace/letters/WCP6573>; and 9 May 1913, Wallace Correspondence Project, 'Letter no. WCP6564', <https://epsilon.ac.uk/view/wallace/letters/WCP6564> (both accessed 20 December 2022).

27 J. Murray to Wallace, 1 May 1913, 'Letter no. WCP7181', <https://epsilon.ac.uk/view/wallace/letters/WCP7181> (accessed 22 December 2022).

28 Wallace to J. Marchant, 1 September 1913, Wallace Correspondence Project, 'Letter no. WCP6557', <https://epsilon.ac.uk/view/wallace/letters/WCP6557> (accessed 22 December 2022); Marchant, *op. cit.* (note 18), pp. vii–xiv.

natural selection earlier than himself, but in explicating it in so thorough and effective a manner in *On the origin of species*, a book he held in extremely high regard. However, as becomes clear in his planned book, Wallace also underscored his independent formulation of the theory, something he had not emphasized until just a few years prior to the ‘Darwin and Wallace’ project.

It is further evident from the subtitle that Wallace intended to once again address the explanatory power of natural selection as the primary if not sole mechanism behind organic evolution, as he saw it. Although it is possible that Wallace might have also used this opportunity to reiterate his claim, first made in 1869 in the earliest public announcement of his spiritualist leanings, that natural selection cannot explain the evolution of the human brain, his main object was to underscore the central role of natural selection in evolution more generally, including the evolution of humans (at least bodily). This supposition is consistent with Wallace’s repeated later-life defence of Darwinism—with natural selection at its core—against attacks by neo-Lamarckians and others who variously claimed that natural selection was an inadequate or incomplete explanation for evolution. This is a key culminating argument of the planned book, as is evident in chapter VIII, and indeed may be its main object.

#### Suggested Contents.

##### Chapter I

A sketch of the more salient Conditions and Events which led them, independently, to the idea of Natural Selection—(travel—Malthus—geographical distribution &c. &c.)

Wallace makes it clear that he and Darwin *independently* came to natural selection, and he planned to discuss circumstances that led them to their respective discoveries. It is perhaps noteworthy that Wallace twice mentions his independent discovery of natural selection in this book outline; this is stated explicitly here in the sketch to chapter 1, and the second instance is found in his sketch of chapter 7. His status as independent originator of natural selection appeared to be very much on Wallace’s mind in his final years, in contrast to his decades-long tendency to give sole credit to Darwin. In addition to the double mention in this outline of his final book, Wallace’s relatively brief (~2000 word) speech at the Darwin–Wallace Celebration of 1 July 1908, accepting the first Darwin–Wallace Medal bestowed by the Linnean Society of London, also twice mentions his independent discovery, one of them with emphasis.<sup>29</sup>

Wallace’s speech at the Darwin–Wallace Celebration provides insight into his views of their independent discovery, and how he might have approached the subject in his planned book. In his 1908 speech he discussed the three ‘salient Conditions and Events’ mentioned here (travel, Malthus, geographical distribution, etc.), but not in that order, and he prefaced them with another important quality he and Darwin shared: a passion for beetle-collecting. Wallace maintained that his and Darwin’s appreciation of the apparently endless minute variations and adaptations presented by beetles was far more important than one might suppose: ‘this superficial and almost child-like interest in the outward forms of living things, which, though often despised as unscientific, happened to be *the only one* which would lead us towards a solution of the problem of species.’<sup>30</sup>

29 A. R. Wallace, ‘[acceptance speech on receiving the Darwin–Wallace Medal on 1 July 1908]’, in *The Darwin–Wallace celebration held on Thursday, 1st July 1908, by the Linnean Society of London* (printed for the Linnean Society by Burlington House, Longmans, Green & Co., London, 1909), pp. 5 and 10.

30 *Ibid.*, p. 8; emphasis is Wallace’s.

Wallace then cites the fact that both he and Darwin were travelling naturalists. Travel provides an astute observer with a comparative database, something Darwin noted while on the *Beagle* voyage: 'It appears to me that nothing can be more improving to a young naturalist, than a journey in distant countries ... the habit of comparison leads to generalization.'<sup>31</sup> Wallace later referred to his own travels, in the Malay archipelago in particular, as the 'central and controlling incident' of his life.<sup>32</sup> It was in travel to some of the world's most biologically rich regions, Wallace maintained in his 1908 speech, that he and Darwin 'thus had forced upon our attention all the strange phenomena of local and geographical distribution, with the numerous problems to which they give rise. Thenceforward our interest in the great mystery of how species came into existence was intensified.'<sup>33</sup> The suggestion is that both were deeply impressed by striking patterns in nature, geographical distribution among them, patterns that make sense only in light of the process of descent with modification, to use Darwin's expression. Both Darwin and Wallace came to believe in the reality of transmutation, species change, before hitting upon a plausible mechanism.

In Wallace's acceptance speech, Malthus is mentioned as the third key factor underlying his and Darwin's discovery. Through travel and observation, Wallace suggests, the stage was set for an appreciation of the significance of Malthus: 'Finally, both Darwin and myself, at the critical period when our minds were freshly stored with a considerable body of personal observation and reflection bearing upon the problem to be solved, had our attention directed to the system of positive checks as expounded by Malthus in his "Principles of Population".'<sup>34</sup> Their minds thus prepared, the effect of reading Malthus, he declares, was like applying friction to a match—population pressure and the struggle for existence inspiring insight into the mechanism of species change, natural selection.

## Chapter II

The diversities and similarities in their respective Environments—social and educational—the diversities being much the more important. Environment was therefore not the determining factor in their coincident Life-Work.

The dissimilarities in Wallace and Darwin's familial, social and educational background are indeed far greater than the similarities. Both were penultimate children, Wallace the eighth of nine children (and third son) of impecunious middle-class parents, Darwin the fifth of six children (and second son) of wealthy parents and grandparents—with notable physicians on his father's side and famed Wedgwood pottery magnates on his mother's. Darwin undertook medical studies for two years at the University of Edinburgh, then matriculated at Christ's College, Cambridge, where he graduated with a BA degree in 1831—with plans, at the time, to take holy orders and become a country vicar. Darwin's Cambridge connections, however, soon led to an invitation for the new graduate to join the global surveying voyage of the Royal Navy vessel HMS *Beagle* as naturalist-companion to the captain, an opportunity made possible by both his social standing and his family wealth, as his father Robert Darwin underwrote the trip for his son. The formal education of Wallace, in contrast, ended at age 14 when he was forced to leave Hale's Grammar

31 R. Keynes, *Charles Darwin's Beagle diary* (Cambridge University Press, Cambridge, 2001), p. 446.

32 Wallace, *op. cit.* (note 7), vol. 1, 336.

33 Wallace, *op. cit.* (note 29), p. 9.

34 *Ibid.*

School in Hertford soon after the death of his father, as family finances worsened. He set off to work, first in London, lodging with and assisting his brother John who was apprenticed to a master builder, and then in the English–Welsh borderlands as assistant surveyor to his eldest brother, William, who had a surveying business that was thriving for a time owing to the expansion of the railways and the new enclosure laws.

One striking and important similarity in their educational experience is the taste both Darwin and Wallace showed for eclectic reading, especially on scientific subjects. The prosperous Darwin home was full of books, and so too was the household of Alfred Russel Wallace's youth, facilitated by his father's sometime position as Hertford town librarian. Wide reading was an interest both retained into early adulthood and beyond. Although Darwin later lamented that his time at Cambridge was 'sadly wasted ... and worse than wasted',<sup>35</sup> he showed enthusiasm for Milton, William Paley and natural history and related scientific subjects, so much so that he became known as 'the man who walks with Henslow' in reference to his esteemed botany professor John Stevens Henslow, who, not coincidentally, played a key role in Darwin's invitation to join the *Beagle* voyage.<sup>36</sup> At the time, Darwin was enthralled too with Alexander von Humboldt's *Personal narrative*, and longed to travel in the great naturalist's footsteps—a book that was also to fire the imagination of Wallace a few years later. While Wallace did not have the advantage of access to an extensive university library, he regularly availed himself of mechanics' institute libraries and free public libraries, then a novelty, as well as free lectures. When in 1844 he was laid off by his brother owing to a downturn in the surveying business, Wallace took a job in Leicester teaching elementary mathematics, during which time he undertook lessons in more advanced mathematics by the school master and continued an eclectic reading programme that included scientific and literary works. He also befriended H. W. Bates, who introduced him to insect collecting. Wallace's self-education continued after his return to Neath a year later (following William's death), taking on the surveying business while frequenting the Neath Mechanics' Institute and Philosophical Society, continuing insect collecting and reading increasingly deeply of scientific works such as Lyell, Darwin, Humboldt and Malthus.<sup>37</sup>

Given the striking educational and social differences in his and Darwin's backgrounds, Wallace concluded that 'environment' was not the determining factor in their coincident life-work. The implication is that the determining factor (or factors) is constitutional, hereditary, as becomes clear in his notes for the following chapter. This is consistent with Wallace's hereditarian view of human behaviour and mental and moral attributes—and his concomitant rejection of Lamarckism, the inheritance of acquired characteristics. Such a hereditarian view underlies Wallace's early (1864) model of the evolution of humans by natural selection first bodily and then, at a later phase, mentally and morally.<sup>38</sup> It also underlies his later embrace of women's free choice in marriage as a means of social improvement—a form of sexual selection by female choice inspired by Wallace's reading of American socialist Edward Bellamy, where women's selection of husbands with the best traits mentally and morally would help improve society generally as these traits were

35 N. Barlow (ed.), *The autobiography of Charles Darwin 1809–1882* (Collins, London, 1958), p. 60.

36 *Ibid.*, p. 64.

37 Wallace, *op. cit.* (note 7), vol. 1, pp. 87–88, 231–232, 254–256.

38 A. R. Wallace, 'The origin of human races and the antiquity of man deduced from the theory of "natural selection"', *J. Anthropol. Soc. Lond.* 2, clviii–clxx (1864).

passed on to their children.<sup>39</sup> Yet, at the same time, Wallace seemed to stress nurture over nature, as when he argued for the beneficial effects of improved conditions for the working class. For example, late in life, about the time of the *Darwin and Wallace* book sketch, he clearly leaned toward the pre-eminent effects of environment in allowing for human development, as Marchant related:

One day, towards the end of his long life when we were discussing the subject of heredity and environment with Dr. Alfred Russel Wallace, he emphatically exclaimed: 'Leave heredity alone until we have made the environment of every child from conception to death the best possible for its full and free development, and then we can begin to think about the influences of heredity, which may be small.' Environment, he felt, was practically all, so far as we are concerned, and it was unmitigated humbug to talk about hereditary class distinctions being rooted in Nature. 'An individual is, of course, a product of nature and nurture, but it is one-tenth the former and nine-tenths the latter.'<sup>40</sup>

Perhaps the best way to understand this apparent contradiction is to consider that in the here and now Wallace advocated for improved conditions—for workers' rights, economic equality, women's political and economic freedom, etc. Such improved conditions (*nurture*) would permit healthy development and attainment of each person's full potential, but, taking the long view, these same improved social conditions would also set the stage for women to exercise free choice in marriage, selecting husbands not based on economic necessity but on personal qualities. The optimist in Wallace (and others who advocated this position) argued that, with such freedom to choose, women would select mainly the most upright, moral and intelligent of men to marry, and thereby would over time improve humanity as a whole through this enlightened mate selection process (*nature*).

### Chap[ter] III

Direct Heredity also unlike—Similarity of intellectual character must therefore have been due to chance intermingling of somewhat remote ancestral traits, leading to an almost identical result in their scientific discovery.

Although Wallace turned to a hereditarian explanation for the intellectual proclivities he shared with Darwin, he also argued against any effect in their *direct* heredity. Instead he looks to ancestry—an intermingling of traits or qualities derived from more remote ancestors, producing commonalities in intellectual curiosity, a taste for certain kinds of scientific subjects and so on. Habits and qualities of mind including personality traits were considered to be heritable by Wallace and Darwin (and others of their time), but studies of heredity also showed that certain traits can disappear for a time only to re-emerge even generations later. The notion that certain heritable traits could underlie or lead to a common scientific discovery may be hopelessly simplistic in the modern view, but what Wallace likely has in mind is a heritable (we would now say genetic inheritance) propensity for curiosity, travel and scientific appetite more broadly. These are rather general mental or personality traits, shared by many, so cannot of course explain the

39 A. R. Wallace, 'Human selection', *Fortnightly Rev.* 48 (n. ser.), 325–337 (1890); 'Human progress: past and future', *Arena* 5, 145–159 (1892); See also K. A. Hamlin, 'Sexual selection and the economics of marriage: "female choice" in the writings of Edward Bellamy and Charlotte Perkins Gilman', in *America's Darwin: Darwinian theory and US literary culture* (ed. T. Gianquitto and L. Fisher), pp. 151–180 (University of Georgia Press, Athens, GA, 2014).

40 J. Marchant, '[A. R. Wallace's comments on nature vs. nurture]', in *Birth-rate and empire* (Williams & Norgate, London, 1917), p. 101.

similarity of the *particular* paths any two people take to mutual discovery. Rather, such traits can be seen as helping to promote certain habits of mind and interest that, fortuitously, lead to similar lines of investigation and discovery.

A modern school of thought seeking to explain factors that shape such personality traits as conservatism and rebelliousness (which can translate into a tendency to reject or embrace unorthodox ideas) approaches the question from the perspective of psychological dynamics associated with birth order. In this view, first-borns are posited to be more conservative and supportive of societal norms while later-borns tend to push the envelope, with greater receptivity to ideas that run counter to orthodoxy. Darwin and Wallace appear to fit this pattern, both being later-borns who came to embrace heterodox ideas such as transmutation and agnosticism (and more, in Wallace's case), and thereby contributed to a revolution in the natural sciences.<sup>41</sup> Based on meta-analysis of large transnational birth-order datasets, however, evidence for birth-order effects on most personality and other psychological traits appears to be equivocal.<sup>42</sup>

Whatever the factors that shape personality, including curiosity and openness to new ideas, it is perhaps most parsimonious to view Darwin and Wallace's mutual discovery as coincidental, and even not all that unexpected considering the state of the science at the time. The nature of species and their origins was recognized as an important unresolved question by many naturalists of the period, and the ever-growing global biogeographical and paleontological databases increasingly supported transmutation of some kind. As with continental drift and plate tectonics in the following century, a log jam of evidence for a history of change was steadily building, needing only a plausible mechanism to allow the lines of evidence fall into place. Wallace's Sarawak Law paper (1855) exemplifies this process, logically laying out the available lines of evidence strongly suggesting a close correspondence of species in space and time, but lacking a mechanism. Darwin and Wallace ultimately hit upon essentially the same mechanism for species change, albeit some 20 years apart—perhaps not so striking a coincidence as commonly thought.

#### Chap[ter] IV

Their literary work compared—the 'Naturalists' Voyage' with the 'Amazon and Rio Negro' and 'Malay Archipelago'—the 'Origin of Species' with 'Darwinism': the 'Autobiography and Letters' with 'My Life'—

It would be interesting to see how Wallace (through Marchant) would have compared and contrasted these paired sets of 'literary works'. Note that, in addition to his and Darwin's travel memoirs and autobiographies, Wallace puts *On the origin of species* and his book *Darwinism* in this 'literary' category. Indeed, Darwin viewed *Origin* as more literary than scientific *per se*, an abstract written as a narrative argument—'one long argument', as he described it<sup>43</sup>—lacking the copious detail and footnoted references typical of scientific treatises of the day. Wallace modelled *Darwinism* on *Origin*, with updates: 'The present

41 See, for example, F. J. Sulloway, *Born to rebel: birth order, family dynamics, and creative lives* (Pantheon Books, New York, 1996); M. Shermer, *In Darwin's shadow: the life and science of Alfred Russel Wallace: a biographical study on the psychology of history* (Oxford University Press, Oxford, 2002).

42 J. M. Rohrer, B. Egloff and S. C. Schmukle, 'Examining the effects of birth order on personality', *Proc. Natl Acad. Sci. USA* **112** (46), 14224–14229 (2015).

43 Darwin, *op. cit.* (note 4), p. 459.

work treats the problem of the Origin of Species on the same general lines as were adopted by Darwin', Wallace states in the Preface, 'but from the standpoint reached after nearly thirty years of discussion, with an abundance of new facts and the advocacy of many new or old theories.'<sup>44</sup>

The travel memoirs of the two naturalists make for an interesting comparison as well. Note Wallace's reference to 'the Naturalists' voyage'. Darwin's *Journal of researches*—his 'first literary child'<sup>45</sup>—recounted the *Beagle* voyage. First published in 1839, the book was issued in a second edition in 1845 under the same title, as were most subsequent reprints. The book was published under the title *The voyage of the Beagle* for the first time in 1905,<sup>46</sup> a title that immediately caught on and was seemingly the edition Wallace had in mind in 1913. He was well familiar with and greatly admired Darwin's book; in 1846 Wallace commented in a letter to H. W. Bates that he 'first read "Darwin's Journal" 3 or 4 years back & have lately reread it', finding the book 'second only to "Humbolts [sic] personal narrative" [and] as a work of general interest perhaps superior to it'.<sup>47</sup> Wallace may have hoped to emulate Darwin's book with his own first travel memoir, *A narrative of travels on the Amazon and Rio Negro* (1853). As remarkable as this book was in light of the catastrophic loss of Wallace's Amazonian collections and most of his notebooks and sketches when his ship burned on the trip home, it received a lukewarm reception. Darwin's ungenerous response (albeit made later in private correspondence) may have been typical: 'hardly facts enough', he complained to H. W. Bates, and to J. D. Hooker he commented on its 'extreme poverty of observation'.<sup>48</sup>

Wallace's second travel narrative received a far better reception. *The Malay archipelago; the land of the orang-utan and the bird of paradise*, documented Wallace's eight years (1854–1862) crisscrossing the vast archipelago as he collected and explored from Singapore and Sumatra in the west to the Aru Islands and New Guinea in the east. The book was published to great acclaim in 1869. Rather than adopting a strict chronological approach, Wallace structured his memoir geographically—with so much travelling back and forth, revisiting some locales multiple times over several years, this proved to be an effective device to recount observations and experiences in a narrative framework. One year after the publication of *The Malay archipelago*, the Société de Géographie in Paris awarded Wallace the Gold Medal for Research Expeditions (Voyages d'Étude, Missions et Travaux de Reconnaissance) in recognition of his remarkable explorations. The medal bore the engraved inscription 'À Alfred Russel-Wallace | Archipel Malais | 1854–1862'.<sup>49</sup>

By then, Wallace was famous as co-discoverer of the principle of natural selection, indefatigable explorer and collector, and thinker of the first rank welcomed into Darwin's elite scientific circle with a series of scientific papers and spirited defences of his and

44 A. R. Wallace, *Darwinism: an exposition of the theory of natural selection with some of its applications* (Macmillan & Co., London and New York, 1889), p. v.

45 Barlow, *op. cit.* (note 35), p. 116.

46 C. R. Darwin, *The voyage of the 'Beagle'* (Amalgamated Press Ltd, London, 1905).

47 Wallace to H. W. Bates, 11 April 1846, Wallace Correspondence Project, 'Letter no. WCP340', <https://epsilon.ac.uk/view/wallace/letters/WCP340> (accessed 22 December 2022).

48 C. R. Darwin to H. W. Bates, 3 December 1861, Darwin Correspondence Project, 'Letter no. DCP-LETT-3338', <https://www.darwinproject.ac.uk/letter/DCP-LETT-3338.xml> (accessed 20 December 2022); Darwin to J. D. Hooker, 15 and 22 May 1863, Darwin Correspondence Project, 'Letter no. DCP-LETT-4167', <https://www.darwinproject.ac.uk/letter/DCP-LETT-4167.xml> (accessed 20 December 2022).

49 Morton & Eden catalogue no. 117, 'Medals, orders and decorations' auction, 20 July 2022, lot 872.

Darwin's theory to his credit since his return to Britain in 1862. As one of many expressions of Wallace's magnanimity toward Darwin, whom he might have viewed as a bitter rival, he dedicated *The Malay archipelago* to his senior colleague: 'Not only as a token of personal esteem and friendship', the dedication read, 'but also to express my deep admiration for his genius and his works'.<sup>50</sup> Darwin was deeply touched, writing to Wallace that the dedication was 'a thing for my children's children to be proud of'.<sup>51</sup>

It is unclear, finally, how Wallace would have compared Darwin's autobiography with his own, as the two are structured very differently. Darwin's relatively brief autobiography was initially written in 1876, not for public consumption but for his family, entitled *Recollections of the development of my mind and character*. After Darwin's death, an edited version (with passages critical of religion removed) was included as the second chapter of the first volume of *The life and letters of Charles Darwin*, prepared by Darwin's son, Francis. The deleted passages were later restored by Darwin's granddaughter, Nora Barlow, in a 1958 edition of the autobiography.<sup>52</sup>

Wallace, in contrast, did write his autobiography for public consumption, and his title is revealing: *My life: A record of events and opinions*, running to two volumes (1905). Although some letters are reproduced, Wallace's autobiography is mainly narrative (events, recollections) with much ancillary material including many sidebars ('opinions' that Wallace felt strongly about sharing). Three years after Wallace's death, James Marchant brought out *Alfred Russel Wallace: letters and reminiscences*, in two volumes (1916), and in many respects this is more comparable to Francis Darwin's *Life and letters of Charles Darwin* volumes.

#### Chap[ter] V

The Scientific writings of Darwin:—the 'Origin of Species' as a popular exposition of a new theory—'Animals and Plants under Domestication'—being a portion of the vast collection of facts and observations on which the theory was based—the 'Descent of Man' and all other works being extensions and applications of the theory, founded mainly on his own observation and Experiment—Personal experiment the preponderating factor.

In this chapter Wallace was to offer an analysis of Darwin's scientific works, and he astutely recognized that these fall into two categories. First he links the first two books, *On the origin of species* (1859) and *Variation of animals and plants under domestication* (1868), stating that the latter represents 'a portion of the vast collection of facts and observations on which the theory was based'. Indeed, perhaps unbeknownst to Wallace, *Variation* was the first of three volumes Darwin had planned to expand and buttress his arguments in *Origin*. As previously noted, Darwin viewed *On the origin of species* as an 'abstract', since he had originally planned to write a far larger book (to be entitled *Natural selection*). As such, *Origin* is indeed a popular exposition as Wallace suggests here—although perhaps closely argued in places, it is a narrative unburdened by the numerous references of authorities and exhaustive examples that *Natural selection* would have had.<sup>53</sup> Conscious of the criticism this would invite, in *Origin*'s introduction Darwin declared his

50 A. R. Wallace, *The Malay archipelago: the land of the orang-utan and the bird of paradise*, 2 vols (Macmillan & Co., London, 1869), dedication.

51 Darwin to A. R. Wallace, 5 March 1869, Wallace Correspondence Project, 'Letter no. WCP1916', <https://epsilon.ac.uk/view/wallace/letters/WCP1916> (accessed 22 December 2022).

52 Barlow, *op. cit.* (note 35).

53 R. C. Stauffer (ed.), *Charles Darwin's natural selection: being the second part of his big species book written from 1856 to 1858* (Cambridge University Press, Cambridge, 1975).

intention to provide a more detailed treatment in the future: 'No one can feel more sensible than I do of the necessity of hereafter publishing in detail all the facts, with references, on which my conclusions have been grounded; and I hope in a future work to do this.'<sup>54</sup> He actually planned to follow *Origin* with not one but three future works dedicated to a fuller exposition of his theory, one for each of the three sections of his 'one long argument'. Soon after *Origin* was published he shared this plan with Huxley ('You have hit on exact plan, which on advice of Lyell, Murray &c I mean to follow, viz bring out separate volumes in detail & I shall begin with domestic productions') and his cousin William Darwin Fox ('I am going soon to begin my bigger book, which I shall publish as 3 separate volumes, with distinct titles, but with a general title in addition').<sup>55</sup>

The 36-page chapter on domestication in *Origin* was expanded into the two-volume *Variation of animals and plants under domestication*, where Darwin reiterated in the Introduction his intention to provide an exposition of his theory in three works of which *Variation* was the first. In the second, he planned to expand his case for variation in nature, the struggle for existence and natural selection, and address various difficulties, and in the third he would 'try the principle of natural selection by seeing how far it will give a fair explanation of the several classes of facts just alluded to'.<sup>56</sup> These planned volumes mirror the three-part structure of *Origin*: the analogy of artificial selection, or domestication (chapter 1); the key empirical data deductively leading to natural selection (heritable variation, struggle, selection: chapters 2–5); and applications of the theory in explaining empirical observations from disparate fields (chapters 6–13).<sup>57</sup> Of these Darwin succeeded in producing only *Variation*. Between his chronic illness, frequent revisions of *Origin*, pursuit of parallel interests that provided additional support for his theory (orchids, climbing plants, carnivorous plants, *et al.*) and the pressure to go public with his theory of human origins and diversification—natural and sexual selection—by the time the two-volume *Variation* came out in 1868 Darwin had abandoned his earlier plan.

Wallace correctly recognized that Darwin's many other books were extensions and applications of his core theory of descent with modification by natural selection. In a sense, Darwin's dozen post-*Origin* books can be seen as one *longer* argument—collectively representing the third of his planned volumes, applications and elaborations of the theory. One important theme of these works is the importance of cross-fertilization and the myriad adaptations to effect this, explored in numerous papers and the books *On the various contrivances by which British and foreign orchids are fertilised by insects* (1862), *The effects of cross and self fertilisation in the vegetable kingdom* (1876) and *The different forms of flowers on plants of the same species* (1877). Another theme is the common ancestry of animals and plants (and by extension all of life), as well as object lessons in how structures can be modified to a diversity of adaptive ends, a variations-on-a-theme view of adaptive modification that also underscores common ancestry and diversification in response to selection. These themes are explored in *Climbing plants* (1865), *Insectivorous plants* (1875) and *The power of movement in plants* (1880).

<sup>54</sup> Darwin, *op. cit.* (note 4), p. 2.

<sup>55</sup> Darwin to T. H. Huxley, 16 December 1859, Darwin Correspondence Project, 'Letter no. DCP-LETT-2585', <https://www.darwinproject.ac.uk/letter/DCP-LETT-2585.xml>; Darwin to W. D. Fox, 25 December 1859, Darwin Correspondence Project, 'Letter no. DCP-LETT-2604', <https://www.darwinproject.ac.uk/letter/DCP-LETT-2604.xml> (both accessed 20 December 2022).

<sup>56</sup> C. R. Darwin, *The variation of animals and plants under domestication*, 2 vols (John Murray, London, 1868), vol. 1, p. 9.

<sup>57</sup> J. T. Costa, 'The Darwinian revelation: tracing the origin and evolution of an idea', *BioScience* **59**, 886–894 (2009).

Another important subject for Darwin was human biology (animal/primate origins, sexual dimorphism and racial diversification), addressed in *The descent of man, and selection in relation to sex* (1871) and *Expression of the emotions in man and animals* (1872). One key argument of *Descent* underscored humanity's primate ancestry, while *Expression* made the broader argument that humans differ in degree, not kind, from other animals; for example, traits commonly thought of as mainly (if not uniquely) human such as emotion, sentiment and intelligence are found in simpler form throughout the animal kingdom, key to arguing for gradual, step-wise evolution of these traits in humans. It is of interest to note that Wallace made an important contribution to Darwin's ideas on human evolution, particularly evolution of mind, but Wallace's own views on this changed by the late 1860s. His influence on Darwin came from his famous 1864 paper, 'The origin of human races and the antiquity of man deduced from the theory of "Natural Selection"', where he argued for human evolution in two phases: natural selection first acting on humans bodily, explaining our primate origins and early racial diversity, but then shifting to act on human mental and moral faculties, halting morphological change while evolution of mind continued: 'while these [physical] changes had been going on, his mental development had correspondingly advanced, and had now reached that condition in which it began powerfully to influence his whole existence, and would therefore become subject to the irresistible action of "natural selection". This action would rapidly give the ascendancy to mind: speech would probably now be first developed, leading to a still further advance of the mental faculties, and from that moment man as regards his physical form would remain almost stationary.'<sup>58</sup>

Wallace thus threaded the human origins and racial diversification needle central to the ongoing monogenist/polygenist debate of the time by arguing that present human diversity represents diversification (through adaptation to local conditions) as it was occurring in the distant past, but was now frozen as selection switched to acting on mind. This model at once explained our primate origins and both the unity of and differences between human races. Impressed, Darwin wrote to Wallace that 'the great leading idea is quite new to me, viz. that during late ages the mind will have been modified more than the body', and several years later (1870), when working on *Descent*, Darwin told Wallace it was 'the best paper that ever appeared in the Anthropological Review!'.<sup>59</sup> Wallace thus contributed to Darwin's model of selection-driven mental and moral evolution in early humans in *Descent*, which combined Wallace's idea with those of Herbert Spencer and Francis Galton on the heritability of mental and moral faculties, arguing that these traits are subject to natural selection.

It is also noteworthy, however, that the subtext of Darwin's 1870 letter was Wallace's apparent about-face over human evolution.<sup>60</sup> Shortly after the 1864 paper, Wallace became a committed spiritualist. He marshalled two arguments to suggest that the human mind could not evolve by natural selection. The first, adopting a strict selectionist view, argued

<sup>58</sup> Wallace, *op. cit.* (note 38), p. clxvi.

<sup>59</sup> Darwin to A. R. Wallace, 28 May 1864, Wallace Correspondence Project, 'Letter no. WCP1858', <https://epsilon.ac.uk/view/wallace/letters/WCP1858> (accessed 8 March 2023); 26 January 1870, Wallace Correspondence Project, 'Letter no. WCP1931', <https://epsilon.ac.uk/view/wallace/letters/WCP1931> (accessed 8 March 2023).

<sup>60</sup> The extent to which Wallace's views on human mental evolution announced in 1869 were prompted by his adoption of spiritualism earlier that decade, or had roots in Wallace's pre-spiritualist writings, is debated. For the continuity of Wallace's views from his earliest writings, see C. H. Smith, 'Alfred Russel Wallace on man: a famous "change of mind"—or not?', *Hist. Phil. Life Sci.* 26 (2), 257–270 (2004).

that the prodigious mental capacity of all people, including so-called ‘uncivilized’ peoples, suggests that this ability could not evolve in a gradual, step-wise manner, since the ‘uncivilized’ in particular (whom he equated with the state of early humans) possess cognitive abilities that greatly exceed the needs or demands of their environment. Wallace’s view was singularly non-racist in that he saw that such peoples were as fully intelligent and full of potential for complex abstraction of thought as Europeans, yet had never had a need or opportunity to express such traits. We now recognize that abstraction has many forms of expression and utility, not just the ability to compose symphonies or derive mathematical equations, but Wallace’s reasoning is logical given his Eurocentric view of complex thought: evolutionary gradualism requires that a trait is useful to its possessor at each stage, in its time and place, so powerful mental capacity could not have arisen this way since it is present in peoples who have never had occasion to exercise such abilities.

The second reason Wallace rejected selection in human mental evolution stemmed from the view, shared by many at the time, including Darwin, that the seemingly ‘low’ of character and means—the poor, destitute, imprudent, feeble-minded, etc.—tended to out-reproduce those members of society of higher character, namely those of intelligence, education, refinement, ability, wealth, etc. It was as true in Victorian times as today that education and wealth is associated with a lower birth rate, as people with resources and prospects either marry and start a family later or simply choose to have fewer or no children. This presented a seeming conundrum to Darwin, Wallace and others: believing that mental and moral traits are heritable, the logic of natural selection raised fears at the time that society would be undermined since the mentally, morally and materially ‘low’ tend to out-reproduce the ‘high’. Yet society has clearly been improving over the past several centuries *despite* this. Wallace’s new-found spiritualism suggested an answer: some guiding agency helping humanity along. Darwin’s response was unsurprising: ‘But I groan over Man—you write like a metamorphosed (in retrograde direction) naturalist!’<sup>61</sup>

Darwin’s final book, *The formation of vegetable mould, through the action of worms, with observations on their habits* (1881), is yet another case study, this time in a form of geological gradualism while underscoring human–animal bonds. Its key arguments are based on extensive field and lab experimentation: first, that the infinitesimal movement of soil by earthworms on a daily basis adds up over time to significant reworking of the landscape—a very Lyellian observation. And, he argued, such seemingly simple organisms as earthworms are capable of problem-solving and exhibit individual behaviours not unlike personality traits of so-called ‘higher’ animals. This is yet another way Darwin sought to underscore gradualism and continuity in organic evolution—the cognitive abilities and sentiments of mammals, including humans, are found in rudimentary form in lowly earthworms.

Note, finally, that Wallace underscored how Darwin’s ideas stemmed from his (Darwin’s) *own* observations and, especially, ‘personal experiment’, which Wallace calls the ‘preponderating factor’. As Wallace recognized, experimentation was indeed a significant part of Darwin’s mode of investigations, even from the time of his earliest insights, and his hands-on experimental approach grew dramatically over time. Indeed, there are many examples of Darwin’s penchant for experimentation while on the *Beagle* voyage, and his home, Down House, can be likened to a field station where numerous experiments

61 *Op. cit.* (note 59), letter WCP1931.

(jokingly referred to by Darwin as his ‘fools’ experiments’) were conducted simultaneously. Darwin might also be considered the original ‘crowd-sourcer’ in that he regularly published open letters to magazines and newspapers asking readers to replicate his experiments and share their findings. The results of several of these experiments were reported in *Origin*, bolstering key arguments, and afterward provided copious data for Darwin’s many papers and books.<sup>62</sup>

#### Chap[ter] VI

The Chief Scientific works of Wallace—‘Darwinism’—‘Island Life’—‘Geographical Distribution of Animals’—&c. their chief characteristic being, that they are the results of reasoning on the observations and experiments of other writers. This applies also to his ‘Cosmological—Social—Political, and Ethical works’.

In this chapter Wallace turns to his own writings, beginning with his major scientific works in reverse chronological order: *Darwinism* (1889), *Island life* (1880) and *The geographical distribution of animals* (1876). It is telling that he notes these are ‘the results of reasoning on the observations and experiments of other writers’, seemingly in contrast with Darwin’s ‘own observations’ and ‘personal experiment’ highlighted in the previous chapter. There is much truth to this—as discussed, many of Darwin’s post-*Origin* books were based on extensive experimentation, most of it original—but, while Wallace did not seem to have a taste for experimentation, he did devise some experiments and engage with others to conduct them (e.g., to test his idea of bright colouration signalling distastefulness in caterpillars<sup>63</sup>). If he intended to present himself as simply an unoriginal synthesizer, this would be another self-deprecating expression of his tendency to take a back seat to Darwin, but it is more likely that Wallace planned to fairly represent his own mode of investigation—after all, as in Darwin’s major works, synthesis of the data and observations of others can be creative in itself, leading to new insights as previously obscure patterns are brought to light and used to support or reject hypotheses. Wallace was as brilliant as Darwin in this mode of investigation, as is evident from his succession of watershed ‘synthetic’ papers such as the Sarawak Law paper (1855), ‘On the natural history of the Aru Islands’ (1857), the ‘Ternate essay’ articulating natural selection (1858), ‘Zoological geography of the Malay archipelago’ (1859)—first articulating what became known as the Wallace Line—and ‘Variation and geographical distribution as illustrated by the Malayan Papilionidae’ (1864), a classic study of mimicry in butterflies. Wallace’s biogeographical books, *Geographical distribution of animals* and *Island life*, are recognized today as landmarks launching a new discipline, evolutionary biogeography, for the same reason: creatively synthesizing information to yield profound insights.

The breadth of Wallace’s works is greater than that of Darwin, which he alludes to in reference to his ‘Cosmological & social—and political, and ethical works’. Wallace was remarkably socially engaged, writing extensively on social, political and ethical matters

62 See, for example, M. Allen, *Darwin and his flowers: the key to natural selection* (Faber & Faber, London, 1977), J. T. Costa, *Darwin’s backyard: how small experiments led to a big theory* (W. W. Norton, New York, 2017) and K. Thompson, *Darwin’s most wonderful plants: a tour of his botanical legacy* (University of Chicago Press, Chicago, 2019).

63 See, for example, A. R. Wallace, ‘Caterpillars and birds’, *Field* 29, 206a–b (1867); ‘Discussion on a paper on the protective adaptations of caterpillars by J. Jenner Weir’ [read at the ESL meeting of 1 March 1869], *Proc. Entomol. Soc. Lond.*, vi–vii (1869).

besides a diversity of scientific subjects—interests that may have contributed to his partial reputational eclipse in subsequent years. We have seen that Darwin's prodigious output of books and papers in the post-*Origin* years were focused studies intended to illustrate, reinforce and extend the arguments of *Origin*, but most of Wallace's books, pamphlets, papers and interviews of the same period (and beyond) ranged from the non-scientific (political and social campaigns as varied as land nationalization, anti-vaccination, women's suffrage) to what some contemporaries saw as unscientific (spiritualism).<sup>64</sup> In the eyes of the scientific establishment, these activities may have been distractions from Wallace's scientific accomplishments at best and seriously undermined his scientific standing at worst.

#### Chap[ter] VII

General conclusions as to the Character and Life-work of the Co-discover[er]s of Natural Selection.

Wallace does not give any indication of what these 'general conclusions' might be, unfortunately. He is, however, explicit in again identifying himself and Darwin as *co-discoverers* of the principle of natural selection, the second instance in this relatively brief book outline where Wallace referred to his independent role in discovering natural selection (the first is in the sketch to chapter 1). Considering the brevity of the document, the language he used may assume a greater significance—such terms as 'independent' and 'co-discover' in so brief a sketch suggests that Wallace was quite concerned late in life of being recognized as the co-originator of natural selection. We may reasonably infer why Wallace became increasingly concerned about his legacy in that regard. His years of deferring to Darwin and refusing the limelight as co-discoverer of natural selection did take its toll—by the early twentieth century the theory was almost universally referred to as Darwin's, and the term Darwinism was synonymous with the process of evolution by natural selection.<sup>65</sup> Wallace himself was perhaps largely responsible for this by constantly referring to the theory as Darwin's, even titling his major exposition of the theory *Darwinism* (1889).<sup>66</sup> But here in his final planned book, just as in his speech at the Darwin–Wallace Celebration just a few years earlier in 1908, *twice* invoking his status as independent co-discoverer of natural selection suggests that even while he honoured his late friend's accomplishment he wished posterity to remember his own original contribution.

64 Note, however, that a great many Victorian scientists and philosophers, and a significant portion of the educated general public, regarded spiritualist investigations as a legitimate field of scientific (especially anthropological) inquiry. Wallace took this view as well, in effect seeing spiritualism as another branch of natural history awaiting exploration. Wallace put the case most forcefully in his earliest published writing on spiritualism, 'The scientific aspect of the supernatural', first published as a serial in *English Leader* in 1866 and reprinted with minor additions as a pamphlet the same year: A. R. Wallace, *The scientific aspect of the supernatural: indicating the desirableness of an experimental enquiry by men of science into the alleged powers of clairvoyants and mediums* (F. Farrah, London, 1866). See also M. J. Kottler, 'Alfred Russel Wallace, the origin of man, and spiritualism', *Isis* 65 (2), 144–192 (1974); E. Sera-Shriar, *Psychic investigators: anthropology, modern spiritualism, and credible witnessing in the late Victorian age* (University of Pittsburgh Press, Pittsburgh, Pennsylvania, 2022).

65 As one striking illustration of the ubiquity of referring to the theory as Darwin's alone, at least 20 books with 'Darwin' or 'Darwinism' in the title were published in London between 1869 and 1900; see coda table 1 in Costa, *Wallace, Darwin, and the origin of species*, *op. cit.* (note 2), p. 271.

66 Wallace uses the terms Darwin, Darwinian or Darwinism 205 times in *Darwinism* (*op. cit.*, note 44), and 225 times in his autobiography *My life* (*op. cit.*, note 7); see coda table 2 in Costa, *op. cit.* (note 2), p. 272. His role as independent co-discover of natural selection is given but once in *Darwinism* (*op. cit.*, note 44, p. 420) and twice in *My life* (*op. cit.*, note 7, vol. 1, p. 240 and vol. 2, p. 383).

## Chap[ter] VIII

The Theory of Nat. Selection as it stands. Its chief upholders in Europe and America. No important difference among Darwinians—Mutationism and Mendelianism totally inadequate—They only deal with side-issues and at the utmost apply only to an infinitesimal fragment of the facts of Organic Evolution and Adaptation, the whole of which are embraced by Natural Selection. It does not claim to account for the First Causes of Life—or for the fundamental forces and powers of Growth and Reproduction—Neither Chemistry nor Physics nor Electricity can explain or account for the fundamental forces of those Sciences, nor those inherent in the very existence of matter itself!

Wallace's final book was to conclude with a defence of natural selection—indeed, this was likely an important motivation behind the book. Wallace had long been a chief defender of evolution by natural selection, and when in the late nineteenth century a number of challenges to the Darwinian/Wallacean model arose he met these head on. One of the first came from Darwin's sometime acolyte George John Romanes, whose 'physiological selection' model postulated that novel variations can arise that initiate reproductive isolation between subpopulations carrying vs. lacking these hypothesized variations, setting the stage for speciation between subpopulations through a kind of higher-level selection. Maintaining that this can occur prior to or altogether without natural selection acting, Romanes argued that 'physiological selection' was an altogether 'new factor' in evolution, a truer or more complete evolutionary model that augmented if not supplanted natural selection. Romanes' model has been reinterpreted in modern terms as one of speciation stemming from chromosomal rearrangements, presaging modern hypotheses of chromosomal speciation.<sup>67</sup> At the time, his claims of improving upon Darwin and Wallace by making for a full theory of natural selection convinced few, criticized as more a rhetorical than an evidence-based model. Wallace was among the least impressed and wrote several critiques of Romanes' theory.<sup>68</sup> His motivation is clear from a letter to Raphael Meldola: 'I wrote my paper quite as much to expose the great presumption & ignorance of Romanes in declaring that Natural Selection is not a theory of the origin of Species,—as it is calculated to do much harm... Romanes poses as the successor of Darwin. This should be stopped before the press & the public finally adopt him as such, & for this reason I wrote my paper.'<sup>69</sup>

Another challenge came from the rise of the neo-Lamarckian school led by palaeontologist Edward Drinker Cope, arguing that natural selection acting on small, continuous variations is insufficient to produce the kind of evolutionary diversification that Darwin (and Wallace) claimed. Several naturalists of the nineteenth century, including such members of Darwin's circle as Huxley and Galton, had doubts about the efficacy of selection acting on minute, continuous variations to produce the adaptive diversity of life. They tended to be sympathetic to Lamarckian processes that could in principle supplement natural selection to speed up the evolutionary process. Although there were Lamarckian elements to Darwin's

67 G. J. Romanes, 'Physiological selection; an additional suggestion on the origin of species', *Zool. J. Linn. Soc.* **19**, 337–411 (1886); D. R. Forsdyke, 'Revisiting George Romanes' "Physiological Selection" (1886)', *Biol. Theory* **15**, 143–147 (2020); but see also R. Faria and A. Navarro, 'Chromosomal speciation revisited: rearranging theory with pieces of evidence', *Trends Ecol. Evol.* **25** (11), 660–669 (2010).

68 The longest and most substantive of Wallace's critiques is found in A. R. Wallace, 'Romanes versus Darwin: an episode in the history of the evolution theory', *Fortnightly Rev.* **40** (n. ser.), 300–316 (1886).

69 Wallace to R. Meldola, 28 August 1886, Wallace Correspondence Project, 'Letter no. WCP4496', <https://epsilon.ac.uk/view/wallace/letters/WCP4496> (accessed 8 March 2023); emphases in original.

own thinking, Cope and others sought to elevate Lamarckism (use and disuse) to a central role in evolution, something that Wallace roundly rejected.<sup>70</sup> Wallace recognized that August Weismann's theory of 'continuity of the germ-plasm' offered strong evidence against the neo-Lamarckians: Weismann argued that the hereditary material was confined to the reproductive organs, and that any acquired, environmentally induced variations of somatic cells therefore cannot be passed on.<sup>71</sup> Wallace endorsed Weismann's work in several positive reviews,<sup>72</sup> and discussed it at length in *Darwinism* (1889) in which he argued that Weismann's theory of germ-plasm continuity and the non-inheritance of acquired characters are fully consistent with the facts of heredity and development, underscoring the importance of natural selection 'as the one invariable and ever-present factor in all organic change'.<sup>73</sup>

The dawn of the twentieth century saw two fresh challenges to Darwinian–Wallacean selection, and it is not coincidental that these are mentioned by name in Wallace's book outline. One was the mutationist school led by Hugo de Vries (who coined the term 'mutation'), which argued for evolution by saltation (sudden and large genetic changes) rather than gradually by selection acting on small variations. De Vries' *Die mutationstheorie*, first published in 1901 to 1903, was translated into English in 1905.<sup>74</sup> The other challenge came from the Mendelian school, developed in the wake of the rediscovery in 1900 of Gregor Mendel's work on inheritance. Mendelism was initially seen by many biologists as antithetical to Darwinian–Wallacean gradualism and supportive of de Vries's mutation theory, owing to the tendency to link the discontinuous variation (and thus evolution) of the mutationists with the (seemingly) discontinuous variation of Mendelian particulate inheritance, leading to the incorrect assumption—including by Wallace—that Mendelism was opposed to continuous variation and gradual evolution.<sup>75</sup> The so-called 'biometrician' school, which agreed with Darwin and Wallace that evolution is effected by selection acting on small, continuous variations, was thus vigorously opposed by the mutationists and early Mendelians.<sup>76</sup> By the end of the second decade of the twentieth century, well after Wallace's death, research into the inheritance and expression of Mendelian traits showed that Mendelism was in fact compatible with Darwinian–Wallacean gradualism, while mutation theory did not stand the test of time. But at the time Wallace grew increasingly alarmed and frustrated that the mutationists and

70 A. R. Wallace, 'The origin of the fittest: essays on evolution by Edward D. Cope, 1887' [review], *Independent* (New York) **39**, 335–336 (1887).

71 Weismann first argued in 1883 that environmental influences on somatic cells cannot become heritable. English translations of subsequent works in which he elaborated his theory include: A. Weismann (R. Meldola, trans.), *Studies in the theory of descent*, 2 vols (Sampson, Low, Marston, Searle & Rivington, London, 1882); A. Weismann (E. B. Poulton, S. Schönland and A. E. Shipley, trans.), *Essays upon heredity and kindred biological problems* (Clarendon Press, Oxford, 1889); and A. Weismann (W. N. Parker and H. Rönnefeldt, trans.), *The germ-plasm: a theory of heredity* (Walter Scott, London, 1893).

72 A. R. Wallace, '[Review of *Studies in the theory of descent* pt. I by August Weismann, 1880, and *Degeneration: a chapter in Darwinism* by E. Ray Lankester, 1880]', *Nature* **22**, 141–142 (1880); '[Review of *Studies in the theory of descent* pt. II by August Weismann]', *Nature* **24**, 457–458 (1881); '[Review of *Studies in the theory of descent* pt. III by August Weismann]', *Nature* **26**, 52–53 (1882).

73 A. R. Wallace, *op. cit.* (note 44), p. 444. See also A. R. Wallace, 'Lamarck versus Weismann', *Nature* **40**, 619–620 (1889).

74 H. De Vries, *Die mutationstheorie*, 2 vols (Von Veit, Leipzig, 1901–1903); *Species and varieties: their origin by mutation* (Open Court Publishing Co., Chicago, 1905).

75 For example: 'The persistency of Mendelian characters is the very opposite of what is needed amid the ever-changing conditions of nature.' A. R. Wallace, *The world of life: a manifestation of creative power, directive mind and ultimate purpose* (Chapman & Hall Ltd, London, 1910), p. 123.

76 W. B. Provine, *The origins of theoretical population genetics* (University of Chicago Press, Chicago, 1987), pp. 69, 90–91.

Mendelians seemed to be ascendant, threatening to displace natural selection altogether. He was especially critical of mutation theory. 'Never, I should think, has such a vast hypothetical structure been erected on so flimsy a basis!'<sup>77</sup> he wrote to one correspondent, and to another he declared:

I consider DeVries' Theory so completely wrong and so wholly opposed to any sound reasoning on the facts of variation and of the struggle for existence, that I am amazed to see how many of the younger Biologists have adopted it, and have supported it by ludicrously exaggerated claims and utterly inconclusive reasoning. The theory utterly fails to account for the marvellous & intricate adaptations in organised beings, which normal variation, rapid increase, & the severity of the struggle for life, inevitably bring about.<sup>78</sup>

It is noteworthy that Wallace focused on mutationism's failure to account for intricate *adaptation*. As naturalists, both Wallace and Darwin were intimately familiar with adaptive structure and function manifest even in the minutest of morphological traits. Wallace was convinced that a process of great and sudden morphological transformations, as advanced by the mutationists, could hardly bring about the exquisitely intricate adaptations everywhere observed in the organic world; the very intricacy of such adaptations was more consistent with slow but steady honing by natural selection, acting incessantly on endless minute variations. It is not a coincidence that, in 1908, Wallace's answer to his rhetorical question—Why did so many of the greatest intellects fail, while Darwin and myself hit upon the solution of the problem of species origins?—focused on an appreciation for superabundant variation, in the form of beetles: 'First (and most important, as I believe), in early life both Darwin and myself became ardent beetle-hunters. Now there is certainly no group of organisms that so impresses the collector by the almost infinite number of its specific forms, the endless modifications of structure, shape, colour, and surface-markings that distinguish them from each other, and their innumerable adaptations to diverse environments.'<sup>79</sup> He likely had the mutationists in mind here. Wallace saw mutationism as simply early nineteenth-century saltationism in a new guise. Mendelism, on the other hand, did represent something novel, but he questioned the generality or significance of its discoveries as understood at the time. These views are clearly stated in a letter to his friend and supporter E. B. Poulton:

'Mutation', as a theory is absolutely nothing new—only the assertion that new species originate always in sports—for which the evidence adduced is the most meagre & inconclusive of any ever set forth with such pretentious claims!...

'Mendelism' is something new, and within its very limited range, important, as leading to conceptions as to the causes & laws of heredity: —but only misleading when adduced as the true origin of species; in Nature—as to which it seems to me to have no part whatever.<sup>80</sup>

77 Wallace to F. Darwin, 29 October 1905, Wallace Correspondence Project, 'Letter no. WCP5636', <https://epsilon.ac.uk/view/wallace/letters/WCP5636> (accessed 8 March 2023).

78 Wallace to A. S. Woodward, 21 April 1907, Wallace Correspondence Project, 'Letter no. WCP4149', <https://epsilon.ac.uk/view/wallace/letters/WCP4149> (accessed 8 March 2023); emphases are Wallace's.

79 Wallace, *op. cit.* (note 29), p. 8.

80 Wallace to E. B. Poulton, 27 July 1907, Wallace Correspondence Project, 'Letter no. WCP4431', <https://epsilon.ac.uk/view/wallace/letters/WCP4431> (accessed 8 March 2023); emphases are Wallace's.

Thus, at a time when blending inheritance was widely assumed, Wallace and the biometricians could not see the relevance of Mendelism to the question of species origins at best, and at worst they were led to dismiss Mendel based on the common misinterpretation that particulate inheritance meant discontinuous variation, and thus saltational over gradual evolution.

The seemingly uncritical acceptance of mutationism and Mendelism disappointed Wallace, and he first published a scathing critique of these together with the neo-Lamarckian school in August 1908.<sup>81</sup> The following year he and some fellow Darwinians declined to contribute to a commemorative volume planned for 1909, the fiftieth anniversary of the publication of *On the origin of species* and Darwin's centennial year—owing, he said, to the prominence accorded mutationism and Mendelism.<sup>82</sup> He applauded Raphael Meldola's review of the volume, in particular the critical treatment of mutationism.<sup>83</sup> Meldola followed that review with another strongly critical of Dewar and Finn's *The making of species*,<sup>84</sup> a book that did not merely champion mutationism, but launched an all-out assault on Wallace: 'It is Wallace who out-Darwins Darwin, who preaches the all-sufficiency of natural selection. For this reason we dub the school which holds this article of belief... the Wallaceian [sic] school.'<sup>85</sup> Even stronger language opened the book: 'We fear that this book will come as a rude shock to many scientific men... We are endeavouring to save biology in England from committing suicide, to save it from the hands of those into which it has fallen... The Wallaceians continue on their course and give to the world a spurious Darwinism...'<sup>86</sup> As much as Wallace admired Meldola's review, he thought it could have been longer and more forceful: 'Such a book, with such pre-advertisements and Preface, will do great harm, by reinforcing the statements of the Mendelians & Mutationists, that Darwinism is "played out"! Such a book as Dewar & Finn's seems to me really disgraceful in its gross misstatements of fact, and absurd attempts at explanations which are mere words.'<sup>87</sup>

Earlier that year Wallace delivered a lecture to the Royal Institution in which he again stressed the primary importance of small continuous heritable variation acted upon by natural selection to effect evolutionary change, presenting empirical frequency data (morphological traits of red-winged blackbirds and bobolinks) to underscore the point that variation is abundant, small-scale and continuously distributed in populations. He also took the opportunity to call out the inadequacy of mutationism and Mendelism, which he dismissed as 'remote from the actual facts and processes of Nature which are effective in originating new species'.<sup>88</sup>

81 A. R. Wallace, 'The present position of Darwinism', *Contemp. Rev.* **94**, 129–141 (1908).

82 W. T. Thiselton-Dyer to A. R. Wallace, 25 June 1909, Wallace Correspondence Project, 'Letter no. WCP2952', <https://epsilon.ac.uk/view/wallace/letters/WCP2952> (accessed 8 March 2023); Wallace to R. Meldola, 27 June 1909, Wallace Correspondence Project, 'Letter no. WCP4564', <https://epsilon.ac.uk/view/wallace/letters/WCP4564> (accessed 8 March 2023). The Seward volume came out in June 1909: A. C. Seward (ed.), *Darwin and modern science: essays in commemoration of the centenary of the birth of Charles Darwin and of the fiftieth anniversary of the publication of the 'Origin of species'* (Cambridge University Press, Cambridge, 1909).

83 R. Meldola, 'Evolution: old and new', *Nature* **80**, 481–485 (1909).

84 R. Meldola, 'The species question re-opened', *Nature* **81**, 481–482 (1909).

85 D. Dewar and F. Finn, *The making of species* (John Lane, London, 1909), p. 25.

86 *Ibid.*, pp. ix–x.

87 Wallace to R. Meldola, 22 October 1909, Wallace Correspondence Project, 'Letter no. WCP4566', <https://epsilon.ac.uk/view/wallace/letters/WCP4566> (accessed 8 March 2023).

88 A. R. Wallace, 'The world of life: as visualised and interpreted by Darwinism', *Fortnightly Rev.* **85** (n. ser.), 411–434 (1909), p. 431.

This context is useful for understanding Wallace's interest in the planned *Darwin and Wallace* volume. Never one to back down from an argument when he was convinced he was correct, Wallace was determined to continue to expose what he saw as the gross inadequacies of the mutationists and Mendelians, and put the nail in the coffin of the neo-Lamarckians. Note that the dual points he makes in the book outline parallel his critiques of these schools from the start, namely that there is 'No important difference among Darwinians', and that mutationism and Mendelism address phenomena that are neither general nor of great importance: 'They only deal with side-issues and at the utmost apply only to an infinitesimal fragment of the facts of Organic Evolution and Adaptation, the whole of which are embraced by Natural Selection.'

Wallace did not live long enough to witness subsequent advances in Mendelian genetics, in particular the realization that Mendel's discovery actually supported the ubiquity of small-scale 'unit factors' (later, alleles) that can combine multi-factorially to yield continuous variation, the raw material of natural selection, and the union of Mendelian genetics with an understanding of chromosomes and their dynamics as well as the nature of mutation and genetic variation. Insights from these important lines of investigation were central to the emerging field of population genetics, pioneered by J. B. S. Haldane and Ronald Fisher in Britain and Sewall Wright in the United States, a field that developed in tandem with the empirical genetics of Theodosius Dobzhansky, Thomas Hunt Morgan, William Bateson and Alfred Sturtevant. Insights from these disciplines, together with those of systematics, embryology and palaeontology, were eventually united under the banner of neo-Darwinism in the movement popularized by Julian Huxley as the 'Modern Synthesis' in his 1942 book of that title. The twenty-first-century insights afforded by genomics further builds on this synthesis, yielding what has been described as the 'neo-Modern Synthesis'.<sup>89</sup> Indeed, the study of genetic variation and its expression itself underwent something of a saltational change in the twentieth century, from crossing studies of simple phenotypic traits, chromosomal banding patterns and karyotype analysis early in the century to the molecular-level visualization of variation through such techniques as chromatography, electrophoresis, DNA and RNA sequencing, and now whole-genome, transcriptome and proteome analyses. Along the way such phenomena as polyploidy, recombination, inversion, transduction and transposition, as well as various mutational processes (e.g., mutagens and replication error), were described and understood in terms of their effects in generating genetic variation, while discovery of such phenomena as epigenetics, phenotypic plasticity, lateral gene transfer, gene regulation and even neo-Lamarckian-like genetic assimilation further enrich understanding of the genetic landscape of organisms, populations and species.<sup>90</sup> Although the processes underlying the origin, effects and fate of genetic variation are far more diverse and complex than could have been imagined by early twentieth-century geneticists, from the ultimate origin of variation in mutation to the processes that promote endless new combinations and expressions of

89 See, for example, M. R. Rose and T. H. Oakley, 'The new biology: beyond the Modern Synthesis', *Biol. Direct* **2**, 30 (2007); M. J. Wade, 'The neo-Modern Synthesis: the confluence of new data and explanatory concepts', *Bio. Sci.* **61** (5), 407–408 (2011); K. N. Laland, T. Uller, M. W. Feldman, *et al.*, 'The extended evolutionary synthesis: its structure, assumptions and predictions', *Proc. R. Soc. Lond. B* **282**, 20151019 (2015), <https://doi.org/10.1098/rspb.2015.1019>.

90 See, for example, R. Bonduriansky and T. Day, *Extended heredity: a new understanding of inheritance and evolution* (Princeton University Press, Princeton, NJ, 2018); D. W. Pfennig (ed.), *Phenotypic plasticity & evolution: causes, consequences, controversies* (CRC Press, Boca Raton, FL, 2021); R. Paro, U. Grossniklaus, R. Santoro and A. Wutz, *Introduction to epigenetics* (Springer Nature, Cham, Switzerland, 2021).

genetic material, the modern view of genetic variation remains essentially that of Darwin and Wallace: ubiquitous, mostly small-scale and continuous heritable variants that selection acts upon.

It is worth noting, finally, that Wallace's final chapter outline does not stop with a critique of perceived challenges to Darwinian–Wallacean gradualism. He planned to go on to discuss how natural selection does not 'claim to account for' such profound questions as the origin of life, or the 'fundamental forces' of growth and reproduction. But just what was Wallace's intended point here? Did he plan on making a statement about life's origins, or about the bearing (or not) of natural selection on (or explaining) life's origins? The question of the origin of life, whether by some form of spontaneous generation (abiogenesis) or another process, has been of great interest ever since the Darwin–Wallace transmutation theory was announced. Darwin avoided discussing the origin of life publicly, briefly touching on the question twice in the *Origin* using language with (perhaps deliberate) theological overtones, and hedging his bets as to whether life originated once ('probably all the organic beings which have ever lived on this earth have descended from some one primordial form, into which life was first breathed') or multiple times ('There is grandeur in this view of life, with its several powers, having been originally breathed into a few forms or into one ...').<sup>91</sup> In private correspondence a dozen years later, Darwin speculated on conditions necessary for early life to arise and, just as importantly, persist:

It is often said that all the conditions for the first production of a living organism are now present, which could ever have been present.—But if (& oh what a big if) we could conceive in some warm little pond with all sorts of ammonia & phosphoric salts,—light, heat, electricity &c present, that a protein compound was chemically formed, ready to undergo still more complex changes, at the present day such matter would be instantly devoured, or absorbed, which would not have been the case before living creatures were formed.<sup>92</sup>

Ecology was key: the absence of heterotrophs at the time that life first arose provided an early window of opportunity for proto-living organisms to persist, after which any arising would likely be consumed.

Wallace touched on life's origins in several of his writings. In the 1870s he favourably reviewed H. Charlton Bastian's work purporting to demonstrate spontaneous generation of living from non-living matter, and saw the significance of this research: 'It is not too much to say that, if its main conclusions are established, it will create a revolution in organic philosophy of equal importance with that which was effected by Mr. Darwin, whose observations and most important theories will, however, remain unaffected by it.'<sup>93</sup> In later years Wallace saw the subject through the lens of a spiritualism that became increasingly theistic. His views around the time of the book outline are perhaps best expressed in the section 'A suggestion as to the origin of life' in his book *The world of life* (1910), in which Wallace speculated about the 'initiation of life' infused into 'suitable life-centres'

<sup>91</sup> Darwin, *op. cit.* (note 4), pp. 484, 490.

<sup>92</sup> C. R. Darwin to J. D. Hooker, 1 February 1871, Darwin Correspondence Project, 'Letter no. DCP-LETT-7471', <https://www.darwinproject.ac.uk/letter/DCP-LETT-7471.xml> (accessed 8 March 2023). In this letter Darwin comments on W. T. Thiselton-Dyer, 'On spontaneous generation and evolution', *Q. J. Microsc. Sci.* **10**, 333–354 (1870).

<sup>93</sup> A. R. Wallace, 'Bastian on the origin of life', *Nature* **4**, 178–179 (1871), and 'Review [of *The beginnings of life: being some account of the nature, modes of origin, and transformations of lower organisms* by H. Charlton Bastian, 1872] I.', *Nature* **6**, 284–287 & 'II.', *Nature* **6**, 299–303 (1872); quote from *Nature* **6**, 303.

(plural, suggesting multiple origins of life) by a divine organizing force.<sup>94</sup> In this, Wallace was building on the central argument of his 1903 book, *Man's place in the universe*, where he presented an early version of what in the twentieth century became known as the 'anthropic principle', the idea that the physical conditions necessary for life to emerge, let alone a sentient being such as humans, are so narrow and specific as to suggest divine design is responsible rather than purely naturalistic processes of planetary, chemical and biological evolution.<sup>95</sup>

Regardless of how life originated, Wallace saw natural selection as the sole process responsible for subsequent evolutionary diversification, albeit with divine or spirit-world guidance with respect to humankind. In the *Darwin and Wallace* chapter outline he threads this needle, and goes on to point out that neither chemistry or physics (nor 'electricity') can explain or account for the 'fundamental forces' of those sciences—perhaps intending to draw a parallel suggesting that just as the inability of those sciences to explain the most fundamental processes in their fields (or indeed, the nature of matter itself) do not invalidate them generally, neither does the inability of natural selection to explain (in his view) the origin of life and forces of variation, growth and reproduction invalidate natural selection in explaining much about organic evolution.

## CONCLUSION

The outline of Alfred Russel Wallace's last, unrealized, book, *Darwin and Wallace*, provides a fascinating window into an important and exciting time in the history of evolutionary biology: the late nineteenth and early twentieth century period when Darwinian evolution generally and natural selection in particular came increasingly under attack, precipitating what Julian Huxley and later historians of science dubbed 'The Eclipse of Darwinism'. Here Wallace, the co-discoverer of natural selection and sole survivor of the Darwin–Wallace circle, lays out plans for vanquishing the hordes, as he saw them, assailing the gates of Darwinism, namely the neo-Lamarckian, mutationist and Mendelian schools purporting to supplant natural selection. What would have perhaps been Wallace's final counter-offensive on the challengers to natural selection and gradualism was to come as the culminating chapter of his planned book, building upon a detailed comparison of his and Darwin's life, works and thought. In so doing, Wallace also intended to underscore his independent discovery of the principle of natural selection, after decades of pointedly deferring to Darwin—in all likelihood not intending to criticize his friend or detract from his accomplishments, but simply to remind readers of his own role.

The *Darwin and Wallace* book plan was conceived in Wallace's ninetieth year, exactly 50 years since his first published defence of Darwinism in 1863. His eloquence undiminished by age, the irony of Wallace's steadfast defence of natural selection is noteworthy, a commitment to the theory so deep that it led to two profound disagreements with Darwin himself: first in

94 A. R. Wallace, *The world of life: a manifestation of creative power, directive mind and ultimate purpose* (Chapman & Hall Ltd, London, 1910), p. 394.

95 For a treatment of Wallace's commitment to theism and spiritualism in his later understanding of his and Darwin's theory of evolution by natural selection, and especially to Wallace's conceptualization of human evolution, see M. Fichman, 'Science in theistic contexts: a case study of Alfred Russel Wallace on human evolution', *Osiris* 16, 227–250 (2001).

Wallace's rigorous and consistent application of natural selection that led him, perhaps counter-intuitively, to reject a role for selection in shaping the human mind in the late 1860s, and second in his sparring with Darwin over sexual selection, ultimately rejecting female choice as boiling down to natural selection (although later reversing himself in the cause of women's rights, calling for economic reform and women's free choice in marriage—a form of sexual selection in humans—as a passive eugenical means to improve society).

Wallace's rejection of neo-Lamarckism and mutationism proved prescient, as these movements were themselves soon eclipsed, but, like other Darwinians of the time, he failed to fully understand the mechanics or import of Mendelism. In the years following Wallace's death, Mendelian genetics was readily incorporated into the models of theoretical population genetics, providing the mathematical basis for elucidating the evolutionary processes of mutation, selection, genetic drift and gene flow. With the Modern Synthesis of the 1940s, Darwinism came out of eclipse, rejuvenated as 'neo-Darwinism' largely owing to the new insights that Mendelian genetics brought to the Darwin–Wallace evolutionary process. Unfortunately, however, even as the Darwinism that Wallace long championed re-emerged to assume centre stage, Wallace himself was eclipsed, overlooked as a lesser light. Wallace's own years-long tendency to promote Darwin as sole originator of the theory of evolution by natural selection thus took its toll, a self-demotion that his planned book *Darwin and Wallace* might have remedied to some extent, if only it had been realized. Today, in the 200th year of Wallace's birth, we celebrate the varied facets of this singular naturalist, traveller and humanitarian, an individual who continues to instruct even through his unrealized writings.

#### DATA ACCESSIBILITY

This article has no additional data.

#### ACKNOWLEDGEMENTS

We are grateful to Lars Fjeldsoe-Nielsen, owner of the *Darwin and Wallace* book outline, for kindly providing permission to reproduce images of the manuscript. We thank Leslie Costa for helpful comments and corrections on the manuscript and James Moore for originally bringing the sale of the *Darwin and Wallace* outline and related documents to GB's attention in 2016. JTC is grateful to Western Carolina University/Highlands Biological Station and the DFG Kolleg-Forschungsgruppe *Imaginarien der Kraft* of the University of Hamburg for support during preparation of the manuscript.

#### APPENDIX

Outline and plan for the proposed book *Darwin and Wallace*, written in black ink in the hand of Alfred Russel Wallace on the rectos of seven 19.5 × 16.5 cm leaves of laid paper (figures 2–8), originally enclosed in a letter dated 24 March 1913 from Wallace to James Marchant: Wallace Correspondence Project, 'Letter no. WCP6576', <https://epsilon.ac.uk/view/wallace/letters/WCP6576> (accessed 8 March 2023).

Notes for the use of Mr. James  
Marchant as to ~~the~~ his proposed  
Book on the Life-Work of  
Darwin and Wallace

By A. R. W.

Figure 2. Cover sheet for *Darwin and Wallace* book outline, in Wallace's hand (WCP6576.8402, p. 1); private collection.

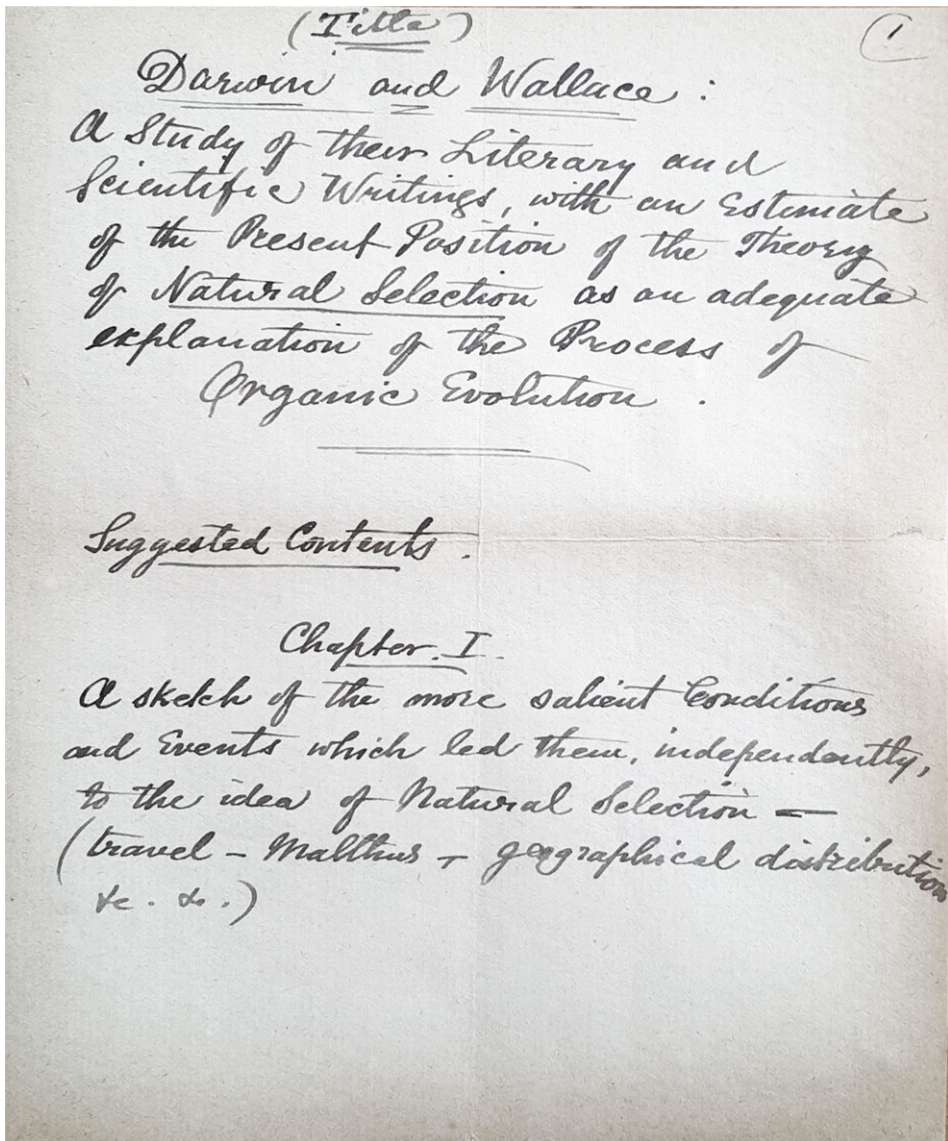


Figure 3. Title page and suggested contents for chapter 1 of *Darwin and Wallace* (WCP6576.8402, p. 2); private collection.

Chapter II.

(2)

The diversities and similarities in their respective Environments - social and educational - the diversities being much the more important. Environment was therefore not the determining factor in their coincident Life-Work.

Chap. III.

Direct Heredity also unlike - Similarity of intellectual Character must therefore have been due to <sup>chance</sup> ~~an~~ intermingling of somewhat remote ancestral traits, leading to an almost identical result in their scientific discovery.

Figure 4. Contents for chapters 2 and 3 of Darwin and Wallace (WCP6576.8402, p. 3); private collection.

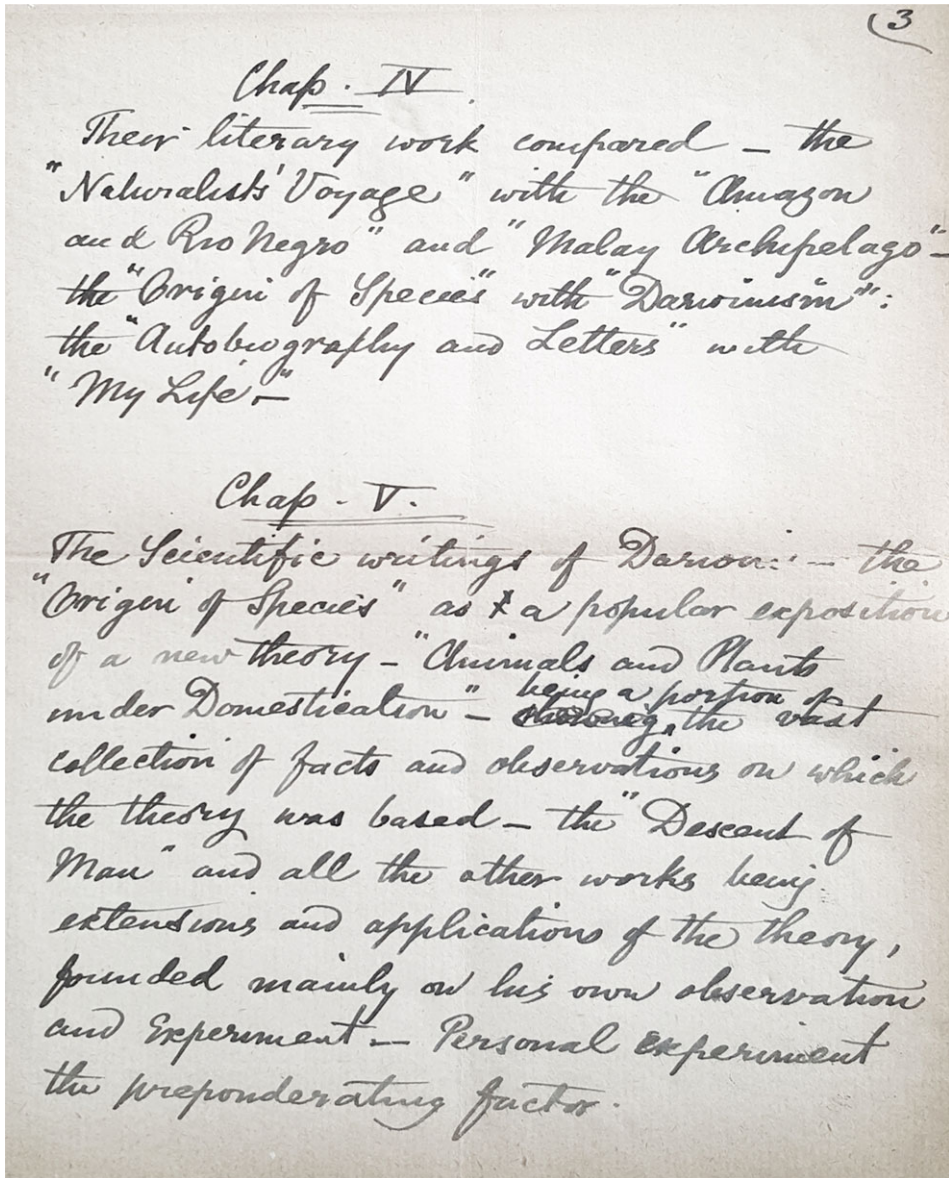


Figure 5. Contents for chapters 4 and 5 of *Darwin and Wallace* (WCP6576.8402, p. 4); private collection.

(4)

Chap. VI.

The Chief Scientific works of Wallace -  
"Darwinism" - "Island Life" - "Geographical  
Distribution of Animals" - &c., their chief  
characteristic being, that they are the results  
of reasoning on the observations and  
experiments of other writers. This  
applies also to his Cosmological -  
Social - ~~and~~ Political, and Ethical  
works.

Chap. VII.

General conclusions as to the Character  
and Life-work of the Co-discoverers of  
Natural Selection.

Figure 6. Contents for chapters 6 and 7 of *Darwin and Wallace* (WCP6576.8402, p. 5); private collection.

(5)

Chap. VIII.

The Theory of Nat. Selection as it stands, its chief upholders in Europe and America. No important difference among Darwinians - Mutationism and Mendelianism totally inadequate ~~as~~ They only deal with side issues and ~~can not~~ at the utmost apply only to an infinitesimal fragment of the facts of Organic Evolution and Adaptation, the whole of which are embraced by ~~the~~ Natural Selection. It does not claim to account for the First Causes of Life - or for the fundamental forces and powers of Growth and Reproduction - Neither Chemistry <sup>nor Electricity</sup> nor Physics, can explain a account for the fundamental forces of these Sciences, nor those inherent in the very existence of matter itself!

Figure 7. Contents for chapter 8 of *Darwin and Wallace* (WCP6576.8402, p. 6); private collection.

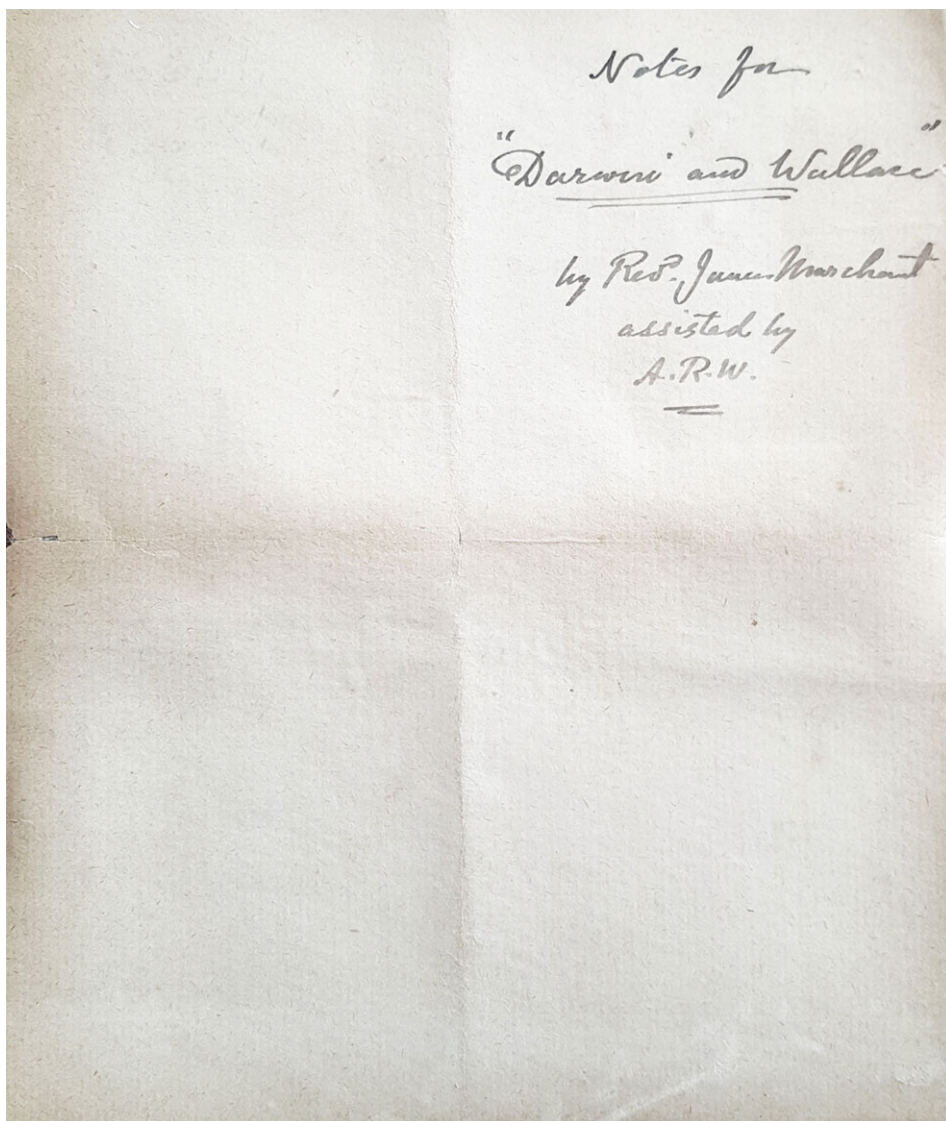


Figure 8. Label for packet of notes for *Darwin and Wallace* (WCP6576.8402, p. 7); private collection.