= Alfred Russel Wallace =

Alfred Russel Wallace OM FRS (8 January 1823 ? 7 November 1913) was a British naturalist , explorer , geographer , anthropologist , and biologist . He is best known for independently conceiving the theory of evolution through natural selection ; his paper on the subject was jointly published with some of Charles Darwin 's writings in 1858 . This prompted Darwin to publish his own ideas in On the Origin of Species . Wallace did extensive fieldwork , first in the Amazon River basin and then in the Malay Archipelago , where he identified the faunal divide now termed the Wallace Line , which separates the Indonesian archipelago into two distinct parts : a western portion in which the animals are largely of Asian origin , and an eastern portion where the fauna reflect Australasia .

He was considered the 19th century 's leading expert on the geographical distribution of animal species and is sometimes called the " father of biogeography " . Wallace was one of the leading evolutionary thinkers of the 19th century and made many other contributions to the development of evolutionary theory besides being co @-@ discoverer of natural selection . These included the concept of warning colouration in animals , and the Wallace effect , a hypothesis on how natural selection could contribute to speciation by encouraging the development of barriers against hybridisation .

Wallace was strongly attracted to unconventional ideas (such as evolution) . His advocacy of spiritualism and his belief in a non @-@ material origin for the higher mental faculties of humans strained his relationship with some members of the scientific establishment .

Aside from scientific work , he was a social activist who was critical of what he considered to be an unjust social and economic system (capitalism) in 19th @-@ century Britain . His interest in natural history resulted in his being one of the first prominent scientists to raise concerns over the environmental impact of human activity . He was also a prolific author who wrote on both scientific and social issues ; his account of his adventures and observations during his explorations in Singapore , Indonesia and Malaysia , The Malay Archipelago , was both popular and highly regarded . Since its publication in 1869 it has never been out of print .

Wallace had financial difficulties throughout much of his life . His Amazon and Far Eastern trips were supported by the sale of specimens he collected and , after he lost most of the considerable money he made from those sales in unsuccessful investments , he had to support himself mostly from the publications he produced . Unlike some of his contemporaries in the British scientific community , such as Darwin and Charles Lyell , he had no family wealth to fall back on , and he was unsuccessful in finding a long @-@ term salaried position , receiving no regular income until he was awarded a small government pension , through Darwin 's efforts , in 1881 .

= = Biography = =

= = = Early life = = =

Alfred Wallace was born in the Welsh village of Llanbadoc , near Usk , Monmouthshire . He was the seventh of nine children of Thomas Vere Wallace and Mary Anne Greenell . Mary Anne was English ; Thomas Wallace was probably of Scottish ancestry . His family , like many Wallaces , claimed a connection to William Wallace , a leader of Scottish forces during the Wars of Scottish Independence in the 13th century . Thomas Wallace graduated in law , but never practised law . He inherited some income @-@ generating property , but bad investments and failed business ventures resulted in a steady deterioration of the family 's financial position . His mother was from a middle @-@ class English family from Hertford , north of London . When Wallace was five years old , his family moved to Hertford . There he attended Hertford Grammar School until financial difficulties forced his family to withdraw him in 1836 , when he was aged 14 .

Wallace then moved to London to board with his older brother John , a 19 @-@ year @-@ old apprentice builder . This was a stopgap measure until William , his oldest brother , was ready to take him on as an apprentice surveyor . While in London , Alfred attended lectures and read books at the

London Mechanics Institute . Here he was exposed to the radical political ideas of the Welsh social reformer Robert Owen and of Thomas Paine . He left London in 1837 to live with William and work as his apprentice for six years .

At the end of 1839 , they moved to Kington , Hereford , near the Welsh border , before eventually settling at Neath in Glamorgan in Wales . Between 1840 and 1843 , Wallace did land surveying work in the countryside of the west of England and Wales . By the end of 1843 , William 's business had declined due to difficult economic conditions , and Wallace , at the age of 20 , left in January .

One result of Wallace 's early travels is a modern controversy about his nationality . Since Wallace was born in Monmouthshire , some sources have considered him to be Welsh . However , some historians have questioned this because neither of his parents was Welsh , his family only briefly lived in Monmouthshire , the Welsh people Wallace knew in his childhood considered him to be English , and because Wallace himself consistently referred to himself as English rather than Welsh (even when writing about his time in Wales) . One Wallace scholar has stated that the most reasonable interpretation is therefore that he was an Englishman born in Wales . It has also been noted that , unlike today , Monmouthshire was technically part of England rather than Wales at the time Wallace was born .

After a brief period of unemployment , he was hired as a master at the Collegiate School in Leicester to teach drawing , mapmaking , and surveying . Wallace spent many hours at the library in Leicester : he read An Essay on the Principle of Population by Thomas Malthus , and one evening he met the entomologist Henry Bates . Bates was 19 years old , and in 1843 he had published a paper on beetles in the journal Zoologist . He befriended Wallace and started him collecting insects . William died in March 1845 , and Wallace left his teaching position to assume control of his brother 's firm in Neath , but his brother John and he were unable to make the business work . After a few months , Wallace found work as a civil engineer for a nearby firm that was working on a survey for a proposed railway in the Vale of Neath .

Wallace 's work on the survey involved spending a lot of time outdoors in the countryside , allowing him to indulge his new passion for collecting insects . Wallace persuaded his brother John to join him in starting another architecture and civil engineering firm , which carried out a number of projects , including the design of a building for the Neath Mechanics ' Institute , founded in 1843 . William Jevons , the founder of that institute , was impressed by Wallace and persuaded him to give lectures there on science and engineering . In the autumn of 1846 , John and he purchased a cottage near Neath , where they lived with their mother and sister Fanny (his father had died in 1843) .

During this period , he read avidly , exchanging letters with Bates about Robert Chambers ' anonymously published evolutionary treatise Vestiges of the Natural History of Creation , Charles Darwin 's The Voyage of the Beagle , and Charles Lyell 's Principles of Geology .

= = = Exploration and study of the natural world = = =

Inspired by the chronicles of earlier travelling naturalists , including Alexander von Humboldt , Charles Darwin and especially William Henry Edwards , Wallace decided that he too wanted to travel abroad as a naturalist . In 1848 , Wallace and Henry Bates left for Brazil aboard the Mischief . Their intention was to collect insects and other animal specimens in the Amazon rainforest for their private collections , selling the duplicates to museums and collectors back in Britain in order to fund the trip . Wallace also hoped to gather evidence of the transmutation of species .

Wallace and Bates spent most of their first year collecting near Belém do Pará , then explored inland separately , occasionally meeting to discuss their findings . In 1849 , they were briefly joined by another young explorer , botanist Richard Spruce , along with Wallace 's younger brother Herbert . Herbert left soon thereafter (dying two years later from yellow fever) , but Spruce , like Bates , would spend over ten years collecting in South America .

Wallace continued charting the Rio Negro for four years , collecting specimens and making notes on the peoples and languages he encountered as well as the geography , flora , and fauna . On 12 July 1852 , Wallace embarked for the UK on the brig Helen . After 26 days at sea , the ship 's cargo

caught fire and the crew was forced to abandon ship . All of the specimens Wallace had on the ship , mostly collected during the last two , and most interesting , years of his trip , were lost . He managed to save a few notes and pencil sketches and little else .

Wallace and the crew spent ten days in an open boat before being picked up by the brig Jordeson , which was sailing from Cuba to London . The Jordeson 's provisions were strained by the unexpected passengers , but after a difficult passage on very short rations the ship finally reached its destination on 1 October 1852 .

After his return to the UK , Wallace spent 18 months in London living on the insurance payment for his lost collection and selling a few specimens that had been shipped back to Britain prior to his starting his exploration of the Rio Negro . During this period , despite having lost almost all of the notes from his South American expedition , he wrote six academic papers (which included " On the Monkeys of the Amazon ") and two books ; Palm Trees of the Amazon and Their Uses and Travels on the Amazon . He also made connections with a number of other British naturalists ? most significantly , Darwin .

From 1854 to 1862 , age 31 to 39 , Wallace travelled through the Malay Archipelago or East Indies (now Singapore , Malaysia and Indonesia) , to collect specimens for sale and to study natural history . A set of 80 bird skeletons he collected in Indonesia and associated documentation can be found in the Cambridge University Museum of Zoology . His observations of the marked zoological differences across a narrow strait in the archipelago led to his proposing the zoogeographical boundary now known as the Wallace line .

Wallace collected more than 126 @,@ 000 specimens in the Malay Archipelago (more than 80 @,@ 000 beetles alone) . Several thousand of them represented species new to science . One of his better @-@ known species descriptions during this trip is that of the gliding tree frog Rhacophorus nigropalmatus , known as Wallace 's flying frog . While he was exploring the archipelago , he refined his thoughts about evolution and had his famous insight on natural selection . In 1858 he sent an article outlining his theory to Darwin ; it was published , along with a description of Darwin 's own theory , in the same year .

Accounts of his studies and adventures there were eventually published in 1869 as The Malay Archipelago , which became one of the most popular books of scientific exploration of the 19th century , and has never been out of print . It was praised by scientists such as Darwin (to whom the book was dedicated) , and Charles Lyell , and by non @-@ scientists such as the novelist Joseph Conrad , who called it his " favorite bedside companion " and used it as source of information for several of his novels , especially Lord Jim .

= = = Return to England , marriage and children = = =

In 1862 , Wallace returned to England , where he moved in with his sister Fanny Sims and her husband Thomas . While recovering from his travels , Wallace organised his collections and gave numerous lectures about his adventures and discoveries to scientific societies such as the Zoological Society of London . Later that year , he visited Darwin at Down House , and became friendly with both Charles Lyell and Herbert Spencer . During the 1860s , Wallace wrote papers and gave lectures defending natural selection . He also corresponded with Darwin about a variety of topics , including sexual selection , warning colouration , and the possible effect of natural selection on hybridisation and the divergence of species . In 1865 , he began investigating spiritualism .

After a year of courtship , Wallace became engaged in 1864 to a young woman whom , in his autobiography , he would only identify as Miss L. Miss L. was the daughter of Lewis Leslie who played chess with Wallace . However , to Wallace 's great dismay , she broke off the engagement . In 1866 , Wallace married Annie Mitten . Wallace had been introduced to Mitten through the botanist Richard Spruce , who had befriended Wallace in Brazil and who was also a good friend of Annie Mitten 's father , William Mitten , an expert on mosses . In 1872 , Wallace built the Dell , a house of concrete , on land he leased in Grays in Essex , where he lived until 1876 . The Wallaces had three children : Herbert (1867 ? 1874) , Violet (1869 ? 1945) , and William (1871 ? 1951) .

= = = Financial struggles = = =

In the late 1860s and 1870s , Wallace was very concerned about the financial security of his family . While he was in the Malay Archipelago , the sale of specimens had brought in a considerable amount of money , which had been carefully invested by the agent who sold the specimens for Wallace . However , on his return to the UK , Wallace made a series of bad investments in railways and mines that squandered most of the money , and he found himself badly in need of the proceeds from the publication of The Malay Archipelago .

Despite assistance from his friends , he was never able to secure a permanent salaried position such as a curatorship in a museum . To remain financially solvent , Wallace worked grading government examinations , wrote 25 papers for publication between 1872 and 1876 for various modest sums , and was paid by Lyell and Darwin to help edit some of their own works .

In 1876 , Wallace needed a £ 500 advance from the publisher of The Geographical Distribution of Animals to avoid having to sell some of his personal property . Darwin was very aware of Wallace 's financial difficulties and lobbied long and hard to get Wallace awarded a government pension for his lifetime contributions to science . When the £ 200 annual pension was awarded in 1881 , it helped to stabilise Wallace 's financial position by supplementing the income from his writings .

= = = Social activism = = =

John Stuart Mill was impressed by remarks criticising English society that Wallace had included in The Malay Archipelago . Mill asked him to join the general committee of his Land Tenure Reform Association , but the association dissolved after Mill 's death in 1873 . Wallace had written only a handful of articles on political and social issues between 1873 and 1879 when , at the age of 56 , he entered the debates over trade policy and land reform in earnest . He believed that rural land should be owned by the state and leased to people who would make whatever use of it that would benefit the largest number of people , thus breaking the often @-@ abused power of wealthy landowners in British society . In 1881 , Wallace was elected as the first president of the newly formed Land Nationalisation Society . In the next year , he published a book , Land Nationalisation ; Its Necessity and Its Aims , on the subject . He criticised the UK 's free trade policies for the negative impact they had on working @-@ class people . In 1889 , Wallace read Looking Backward by Edward Bellamy and declared himself a socialist . After reading Progress and Poverty , the best selling book by the progressive land reformist Henry George , Wallace described it as " Undoubtedly the most remarkable and important book of the present century . "

Wallace opposed eugenics , an idea supported by other prominent 19th @-@ century evolutionary thinkers , on the grounds that contemporary society was too corrupt and unjust to allow any reasonable determination of who was fit or unfit . In the 1890 article " Human Selection " he wrote , " Those who succeed in the race for wealth are by no means the best or the most intelligent ... " . In 1898 , Wallace wrote a paper advocating a pure paper money system , not backed by silver or gold , which impressed the economist Irving Fisher so much that he dedicated his 1920 book Stabilizing the Dollar to Wallace .

Wallace wrote on other social and political topics including his support for women 's suffrage , and repeatedly on the dangers and wastefulness of militarism . In an essay published in 1899 Wallace called for popular opinion to be rallied against warfare by showing people : " ... that all modern wars are dynastic ; that they are caused by the ambition , the interests , the jealousies , and the insatiable greed of power of their rulers , or of the great mercantile and financial classes which have power and influence over their rulers ; and that the results of war are never good for the people , who yet bear all its burthens " . In a letter published by the Daily Mail in 1909 , with aviation in its infancy , he advocated an international treaty to ban the military use of aircraft , arguing against the idea " ... that this new horror is " inevitable , " and that all we can do is to be sure and be in the front rank of the aerial assassins ? for surely no other term can so fitly describe the dropping of , say , ten thousand bombs at midnight into an enemy 's capital from an invisible flight of airships . "

In 1898 , Wallace published a book entitled The Wonderful Century : Its Successes and Its Failures

about developments in the 19th century . The first part of the book covered the major scientific and technical advances of the century ; the second part covered what Wallace considered to be its social failures including : the destruction and waste of wars and arms races , the rise of the urban poor and the dangerous conditions in which they lived and worked , a harsh criminal justice system that failed to reform criminals , abuses in a mental health system based on privately owned sanatoriums , the environmental damage caused by capitalism , and the evils of European colonialism . Wallace continued his social activism for the rest of his life , publishing the book The Revolt of Democracy just weeks before his death .

= = = Further scientific work = = =

Wallace continued his scientific work in parallel with his social commentary . In 1880 , he published Island Life as a sequel to The Geographic Distribution of Animals . In November 1886 , Wallace began a ten @-@ month trip to the United States to give a series of popular lectures . Most of the lectures were on Darwinism (evolution through natural selection) , but he also gave speeches on biogeography , spiritualism , and socio @-@ economic reform . During the trip , he was reunited with his brother John who had emigrated to California years before . He also spent a week in Colorado , with the American botanist Alice Eastwood as his guide , exploring the flora of the Rocky Mountains and gathering evidence that would lead him to a theory on how glaciation might explain certain commonalities between the mountain flora of Europe , Asia and North America , which he published in 1891 in the paper " English and American Flowers " . He met many other prominent American naturalists and viewed their collections . His 1889 book Darwinism used information he collected on his American trip , and information he had compiled for the lectures .

Wallace assembled a huge collection of flora and fauna which were kept in " cabinets . " Only one of these collections remains in its original cabinet . It consists of 1 @,@ 700 @-@ items of a variety of insects , including butterflies , beetles , moths , shells , flies , bees , praying mantises , tarantulas , seedpods , a hornet 's nest , and a small bird . A collector named Robert Heggestad found this cabinet / collection in Washington DC in 1979 and purchased it for $ 600 (not knowing who had assembled it) . Heggestad began documenting references in Wallace 's work to specimens in the cabinet , resulting in a 62 @-@ page report to support the theory that the collection once belonged to Wallace . He also employed graphologist Beverley East to verify the handwriting on the collection . It is Wallace 's only known personal collection still in its original cabinet . Today it is believed that Wallace collected the specimens in the rosewood cabinet for instructional purposes .

= = = Death = = =

On 7 November 1913 , Wallace died at home in the country house he called Old Orchard , which he had built a decade earlier . He was 90 years old . His death was widely reported in the press . The New York Times called him " the last of the giants belonging to that wonderful group of intellectuals that included , among others , Darwin , Huxley , Spencer , Lyell , and Owen , whose daring investigations revolutionised and evolutionised the thought of the century . " Another commentator in the same edition said " No apology need be made for the few literary or scientific follies of the author of that great book on the ' Malay Archipelago ' . "

Some of Wallace 's friends suggested that he be buried in Westminster Abbey , but his wife followed his wishes and had him buried in the small cemetery at Broadstone , Dorset . Several prominent British scientists formed a committee to have a medallion of Wallace placed in Westminster Abbey near where Darwin had been buried . The medallion was unveiled on 1 November 1915 .

= = Theory of evolution = =

= = = Early evolutionary thinking = = =

Unlike Darwin , Wallace began his career as a travelling naturalist already believing in the transmutation of species . The concept had been advocated by Jean @-@ Baptiste Lamarck , Geoffroy Saint @-@ Hilaire , Erasmus Darwin , and Robert Grant , among others . It was widely discussed , but not generally accepted by leading naturalists , and was considered to have radical , even revolutionary connotations .

Prominent anatomists and geologists such as Georges Cuvier , Richard Owen , Adam Sedgwick , and Charles Lyell attacked it vigorously . It has been suggested that Wallace accepted the idea of the transmutation of species in part because he was always inclined to favour radical ideas in politics , religion and science , and because he was unusually open to marginal , even fringe , ideas in science .

He was also profoundly influenced by Robert Chambers ' work , Vestiges of the Natural History of Creation , a highly controversial work of popular science published anonymously in 1844 that advocated an evolutionary origin for the solar system , the earth , and living things . Wallace wrote to Henry Bates in 1845 :

I have a rather more favourable opinion of the ' Vestiges ' than you appear to have . I do not consider it a hasty generalization , but rather as an ingenious hypothesis strongly supported by some striking facts and analogies , but which remains to be proven by more facts and the additional light which more research may throw upon the problem . It furnishes a subject for every student of nature to attend to ; every fact he observes will make either for or against it , and it thus serves both as an incitement to the collection of facts , and an object to which they can be applied when collected .

In 1847 , he wrote to Bates :

I should like to take some one family [of beetles] to study thoroughly , principally with a view to the theory of the origin of species . By that means I am strongly of opinion that some definite results might be arrived at .

Wallace deliberately planned some of his field work to test the hypothesis that under an evolutionary scenario closely related species should inhabit neighbouring territories . During his work in the Amazon basin , he came to realise that geographical barriers ? such as the Amazon and its major tributaries ? often separated the ranges of closely allied species , and he included these observations in his 1853 paper " On the Monkeys of the Amazon " . Near the end of the paper he asks the question , " Are very closely allied species ever separated by a wide interval of country ? "

In February 1855 , while working in Sarawak on the island of Borneo , Wallace wrote " On the Law which has Regulated the Introduction of New Species " , a paper which was published in the Annals and Magazine of Natural History in September 1855 . In this paper , he discussed observations regarding the geographic and geologic distribution of both living and fossil species , what would become known as biogeography . His conclusion that " Every species has come into existence coincident both in space and time with a closely allied species " has come to be known as the " Sarawak Law " . Wallace thus answered the question he had posed in his earlier paper on the monkeys of the Amazon river basin . Although it contained no mention of any possible mechanisms for evolution , this paper foreshadowed the momentous paper he would write three years later .

The paper shook Charles Lyell 's belief that species were immutable . Although his friend Charles Darwin had written to him in 1842 expressing support for transmutation , Lyell had continued to be strongly opposed to the idea . Around the start of 1856 , he told Darwin about Wallace 's paper , as did Edward Blyth who thought it " Good ! Upon the whole ! ... Wallace has , I think put the matter well ; and according to his theory the various domestic races of animals have been fairly developed into species . " Despite this hint , Darwin mistook Wallace 's conclusion for the progressive creationism of the time and wrote that it was " nothing very new ... Uses my simile of tree [but] it seems all creation with him . " Lyell was more impressed , and opened a notebook on species , in which he grappled with the consequences , particularly for human ancestry . Darwin had already shown his theory to their mutual friend Joseph Hooker and now , for the first time , he spelt out the full details of natural selection to Lyell . Although Lyell could not agree , he urged Darwin to publish to establish priority . Darwin demurred at first , then began writing up a species sketch of his

continuing work in May 1856 .

= = = Natural selection and Darwin = = =

By February 1858 , Wallace had been convinced by his biogeographical research in the Malay Archipelago of the reality of evolution . As he later wrote in his autobiography :

The problem then was not only how and why do species change , but how and why do they change into new and well defined species , distinguished from each other in so many ways ; why and how they become so exactly adapted to distinct modes of life ; and why do all the intermediate grades die out (as geology shows they have died out) and leave only clearly defined and well marked species , genera , and higher groups of animals ?

According to his autobiography , it was while he was in bed with a fever that Wallace thought about Thomas Malthus 's idea of positive checks on human population growth and came up with the idea of natural selection . Wallace said in his autobiography that he was on the island of Ternate at the time ; but historians have questioned this , saying that on the basis of the journal he kept at the time , he was on the island of Gilolo . From 1858 to 1861 he rented a house on Ternate from the Dutchman Maarten Dirk van Renesse van Duivenbode . He used this house as a base camp for expeditions to other islands such as Gilolo .

Wallace describes how he discovered natural selection as follows :

It then occurred to me that these causes or their equivalents are continually acting in the case of animals also ; and as animals usually breed much more quickly than does mankind , the destruction every year from these causes must be enormous in order to keep down the numbers of each species , since evidently they do not increase regularly from year to year , as otherwise the world would long ago have been crowded with those that breed most quickly . Vaguely thinking over the enormous and constant destruction which this implied , it occurred to me to ask the question , why do some die and some live ? And the answer was clearly , on the whole the best fitted live ... and considering the amount of individual variation that my experience as a collector had shown me to exist , then it followed that all the changes necessary for the adaptation of the species to the changing conditions would be brought about ... In this way every part of an animals organization could be modified exactly as required , and in the very process of this modification the unmodified would die out , and thus the definite characters and the clear isolation of each new species would be explained .

Wallace had once briefly met Darwin , and was one of the correspondents whose observations Darwin used to support his own theories . Although Wallace 's first letter to Darwin has been lost , Wallace carefully kept the letters he received . In the first letter , dated 1 May 1857 , Darwin commented that Wallace 's letter of 10 October which he had recently received , as well as Wallace 's paper " On the Law which has regulated the Introduction of New Species " of 1855 , showed that they were both thinking alike and to some extent reaching similar conclusions , and said that he was preparing his own work for publication in about two years time . The second letter , dated 22 December 1857 , said how glad he was that Wallace was theorising about distribution , adding that " without speculation there is no good and original observation " while commenting that " I believe I go much further than you " . Wallace trusted Darwin 's opinion on the matter and sent him his February 1858 essay , " On the Tendency of Varieties to Depart Indefinitely From the Original Type " , with the request that Darwin would review it and pass it on to Charles Lyell if he thought it worthwhile . Although Wallace had sent several articles for journal publication during his travels through the Malay archipelago , the Ternate essay was in a private letter . On 18 June 1858 , Darwin received the essay from Wallace . While Wallace 's essay obviously did not employ Darwin 's term " natural selection " , it did outline the mechanics of an evolutionary divergence of species from similar ones due to environmental pressures . In this sense , it was very similar to the theory that Darwin had worked on for twenty years , but had yet to publish . Darwin sent the manuscript to Charles Lyell with a letter saying " he could not have made a better short abstract ! Even his terms now stand as heads of my chapters ... he does not say he wishes me to publish , but I shall , of course , at once write and offer to send to any journal . " Distraught about the illness of his baby son , Darwin put the

problem to Charles Lyell and Joseph Hooker , who decided to publish the essay in a joint presentation together with unpublished writings which highlighted Darwin 's priority . Wallace had not asked for publication of his essay , and indeed , doing so probably contravened the copyright law of the time . Wallace 's essay was presented to the Linnean Society of London on 1 July 1858 , along with excerpts from an essay which Darwin had disclosed privately to Hooker in 1847 and a letter Darwin had written to Asa Gray in 1857 .

Communication with Wallace in the far @-@ off Malay Archipelago was impossible without months of delay , so he was not part of this rapid publication . Fortunately , Wallace accepted the arrangement after the fact , happy that he had been included at all , and never expressed public or private bitterness . Darwin 's social and scientific status was far greater than Wallace 's , and it was unlikely that , without Darwin , Wallace 's views on evolution would have been taken seriously . Lyell and Hooker 's arrangement relegated Wallace to the position of co @-@ discoverer , and he was not the social equal of Darwin or the other prominent British natural scientists . However , the joint reading of their papers on natural selection associated Wallace with the more famous Darwin . This , combined with Darwin 's (as well as Hooker 's and Lyell 's) advocacy on his behalf , would give Wallace greater access to the highest levels of the scientific community . The reaction to the reading was muted , with the president of the Linnean Society remarking in May 1859 that the year had not been marked by any striking discoveries ; but , with Darwin 's publication of On the Origin of Species later in 1859 , its significance became apparent . When Wallace returned to the UK , he met Darwin . Although some of Wallace 's iconoclastic opinions in the ensuing years would test Darwin 's patience , they remained on friendly terms for the rest of Darwin 's life .

Over the years , a few people have questioned this version of events . In the early 1980s , two books , one written by Arnold Brackman and another by John Langdon Brooks , even suggested not only that there had been a conspiracy to rob Wallace of his proper credit , but that Darwin had actually stolen a key idea from Wallace to finish his own theory . These claims have been examined in detail by a number of scholars who have not found them to be convincing . Research into shipping schedules has shown that , contrary to these accusations , Wallace 's letter could not have been delivered earlier than the date shown in Darwin 's letter to Lyell .

= = = = Defence of Darwin and his ideas = = = =

After the publication of Darwin 's On the Origin of Species , Wallace became one of its staunchest defenders on his return to England in 1862 . In one incident in 1863 that particularly pleased Darwin , Wallace published the short paper " Remarks on the Rev. S. Haughton 's Paper on the Bee 's Cell , And on the Origin of Species " in order to rebuke a paper by a professor of geology at the University of Dublin that had sharply criticised Darwin 's comments in the Origin on how hexagonal honey bee cells could have evolved through natural selection .

An even lengthier defence of Darwin 's work was " Creation by Law " , a review Wallace wrote in 1867 for The Quarterly Journal of Science of the book The Reign of Law , which had been written by George Campbell , the 8th Duke of Argyll , as a refutation of natural selection . After an 1870 meeting of the British Association , Wallace wrote to Darwin complaining that there were " no opponents left who know anything of natural history , so that there are none of the good discussions we used to have . "

= = = = Differences between Darwin 's and Wallace 's ideas on natural selection = = = =

Historians of science have noted that , while Darwin considered the ideas in Wallace 's paper to be essentially the same as his own , there were differences . Darwin emphasised competition between individuals of the same species to survive and reproduce , whereas Wallace emphasised environmental pressures on varieties and species forcing them to become adapted to their local conditions , leading populations in different locations to diverge . Some historians , notably Peter J. Bowler , have suggested the possibility that in the paper he mailed to Darwin , Wallace was not discussing selection of individual variations at all but rather group selection . However , Malcolm

Kottler has shown that this notion is incorrect and Wallace was indeed discussing individual variations .

Others have noted that another difference was that Wallace appeared to have envisioned natural selection as a kind of feedback mechanism keeping species and varieties adapted to their environment . They point to a largely overlooked passage of Wallace 's famous 1858 paper :

The action of this principle is exactly like that of the centrifugal governor of the steam engine , which checks and corrects any irregularities almost before they become evident ; and in like manner no unbalanced deficiency in the animal kingdom can ever reach any conspicuous magnitude , because it would make itself felt at the very first step , by rendering existence difficult and extinction almost sure soon to follow .

The cybernetician and anthropologist Gregory Bateson would observe in the 1970s that , though writing it only as an example , Wallace had " probably said the most powerful thing that 'd been said in the 19th Century " . Bateson revisited the topic in his 1979 book Mind and Nature : A Necessary Unity , and other scholars have continued to explore the connection between natural selection and systems theory .

= = = = Warning colouration and sexual selection = = = =

In 1867 , Darwin wrote to Wallace about a problem he was having understanding how some caterpillars could have evolved conspicuous colour schemes . Darwin had come to believe that sexual selection , an agency to which Wallace did not attribute the same importance as Darwin did , explained many conspicuous animal colour schemes . However , Darwin realised that this could not apply to caterpillars . Wallace responded that he and Henry Bates had observed that many of the most spectacular butterflies had a peculiar odour and taste , and that he had been told by John Jenner Weir that birds would not eat a certain kind of common white moth because they found it unpalatable . " Now , as the white moth is as conspicuous at dusk as a coloured caterpillar in the daylight " , Wallace wrote back to Darwin that it seemed likely that the conspicuous colour scheme served as a warning to predators and thus could have evolved through natural selection . Darwin was impressed by the idea . At a subsequent meeting of the Entomological Society , Wallace asked for any evidence anyone might have on the topic . In 1869 , Weir published data from experiments and observations involving brightly coloured caterpillars that supported Wallace 's idea . Warning colouration was one of a number of contributions Wallace made in the area of the evolution of animal colouration in general and the concept of protective colouration in particular . It was also part of a lifelong disagreement Wallace had with Darwin over the importance of sexual selection . In his 1878 book Tropical Nature and Other Essays , he wrote extensively on the colouration of animals and plants and proposed alternative explanations for a number of cases Darwin had attributed to sexual selection . He revisited the topic at length in his 1889 book Darwinism . In 1890 , he wrote a critical review in Nature of his friend Edward Bagnall Poulton 's The Colours of Animals which supported Darwin on sexual selection , attacking especially Poulton 's claims on the " aesthetic preferences of the insect world " .

= = = = Wallace effect = = = =

In 1889 , Wallace wrote the book Darwinism , which explained and defended natural selection . In it , he proposed the hypothesis that natural selection could drive the reproductive isolation of two varieties by encouraging the development of barriers against hybridisation . Thus it might contribute to the development of new species . He suggested the following scenario . When two populations of a species had diverged beyond a certain point , each adapted to particular conditions , hybrid offspring would be less well @-@ adapted than either parent form and , at that point , natural selection will tend to eliminate the hybrids . Furthermore , under such conditions , natural selection would favour the development of barriers to hybridisation , as individuals that avoided hybrid matings would tend to have more fit offspring , and thus contribute to the reproductive isolation of the two incipient species . This idea came to be known as the Wallace effect . Wallace had

suggested to Darwin that natural selection could play a role in preventing hybridisation in private correspondence as early as 1868 , but had not worked it out to this level of detail . It continues to be a topic of research in evolutionary biology today , with both computer simulation and empirical results supporting its validity .

= = = Application of theory to humans , and role of teleology in evolution = = =

In 1864 , Wallace published a paper , " The Origin of Human Races and the Antiquity of Man Deduced from the Theory of ' Natural Selection ' " , applying the theory to humankind . Darwin had not yet publicly addressed the subject , although Thomas Huxley had in Evidence as to Man 's Place in Nature . He explained the apparent stability of the human stock by pointing to the vast gap in cranial capacities between humans and the great apes . Unlike some other Darwinists , including Darwin himself , he did not " regard modern primitives as almost filling the gap between man and ape " . He saw the evolution of humans in two stages : achieving a bipedal posture freeing the hands to carry out the dictates of the brain , and the " recognition of the human brain as a totally new factor in the history of life . Wallace was apparently the first evolutionist to recognize clearly that ... with the emergence of that bodily specialization which constitutes the human brain , bodily specialization itself might be said to be outmoded . " For this paper he won Darwin 's praise .
Shortly afterwards , Wallace became a spiritualist . At about the same time , he began to maintain that natural selection cannot account for mathematical , artistic , or musical genius , as well as metaphysical musings , and wit and humour . He eventually said that something in " the unseen universe of Spirit " had interceded at least three times in history . The first was the creation of life from inorganic matter . The second was the introduction of consciousness in the higher animals . And the third was the generation of the higher mental faculties in humankind . He also believed that the raison d 'être of the universe was the development of the human spirit . These views greatly disturbed Darwin , who argued that spiritual appeals were not necessary and that sexual selection could easily explain apparently non @-@ adaptive mental phenomena . While some historians have concluded that Wallace 's belief that natural selection was insufficient to explain the development of consciousness and the human mind was directly caused by his adoption of spiritualism , other Wallace scholars have disagreed , and some maintain that Wallace never believed natural selection applied to those areas . Reaction to Wallace 's ideas on this topic among leading naturalists at the time varied . Charles Lyell endorsed Wallace 's views on human evolution rather than Darwin 's . Wallace 's belief that human consciousness could not be entirely a product of purely material causes was shared by a number of prominent intellectuals in the late 19th and early 20th centuries . However , many , including Huxley , Hooker , and Darwin himself , were critical of Wallace . As the historian of science Michael Shermer has stated , Wallace 's views in this area were at odds with two major tenets of the emerging Darwinian philosophy , which were that evolution was not teleological (purpose driven) and that it was not anthropocentric (human @-@ centred) . Much later in his life Wallace returned to these themes , that evolution suggested that the universe might have a purpose and that certain aspects of living organisms might not be explainable in terms of purely materialistic processes , in a 1909 magazine article entitled The World of Life , which he later expanded into a book of the same name ; a work that Shermer said anticipated some ideas about design in nature and directed evolution that would arise from various religious traditions throughout the 20th century .

= = = Assessment of Wallace 's role in history of evolutionary theory = = =

In many accounts of the development of evolutionary theory , Wallace is mentioned only in passing as simply being the stimulus to the publication of Darwin 's own theory . In reality , Wallace developed his own distinct evolutionary views which diverged from Darwin 's , and was considered by many (especially Darwin) to be a leading thinker on evolution in his day , whose ideas could not be ignored . One historian of science has pointed out that , through both private correspondence and published works , Darwin and Wallace exchanged knowledge and stimulated each other 's

ideas and theories over an extended period . Wallace is the most @-@ cited naturalist in Darwin 's Descent of Man , often in strong disagreement . Wallace remained an ardent defender of natural selection for the rest of his life . By the 1880s , evolution was widely accepted in scientific circles , but Wallace and August Weismann were nearly alone among prominent biologists in believing that natural selection was the major driving force behind it . In 1889 , Wallace published the book Darwinism as a response to the scientific critics of natural selection . Of all Wallace 's books , it is the most cited by scholarly publications .

= = Other scientific contributions = =

= = = Biogeography and ecology = = =

In 1872 , at the urging of many of his friends , including Darwin , Philip Sclater , and Alfred Newton , Wallace began research for a general review of the geographic distribution of animals . He was unable to make much progress initially , in part because classification systems for many types of animals were in flux at the time . He resumed the work in earnest in 1874 after the publication of a number of new works on classification . Extending the system developed by Sclater for birds ? which divided the earth into six separate geographic regions for describing species distribution ? to cover mammals , reptiles and insects as well , Wallace created the basis for the zoogeographic regions still in use today . He discussed all of the factors then known to influence the current and past geographic distribution of animals within each geographical region . These included the effects of the appearance and disappearance of land bridges (such as the one currently connecting North America and South America) and the effects of periods of increased glaciation . He provided maps that displayed factors , such as elevation of mountains , depths of oceans , and the character of regional vegetation , that affected the distribution of animals . He also summarised all the known families and genera of the higher animals and listed their known geographic distributions . The text was organised so that it would be easy for a traveller to learn what animals could be found in a particular location . The resulting two @-@ volume work , The Geographical Distribution of Animals , was published in 1876 and would serve as the definitive text on zoogeography for the next 80 years .

In this book Wallace did not confine himself to the biogeography of living species , but also included evidence from the fossil record to discuss the processes of evolution and migration that had led to the geographical distribution of modern animal species . For example , he discussed how fossil evidence showed that tapirs had originated in the Northern Hemisphere , migrating between North America and Eurasia and then , much more recently , to South America after which the northern species became extinct , leaving the modern distribution of two isolated groups of tapir species in South America and Southeast Asia . Wallace was very aware of , and interested in , the mass extinction of megafauna in the late Pleistocene . In The Geographical Distribution of Animals (1876) he wrote , " We live in a zoologically impoverished world , from which all the hugest , and fiercest , and strangest forms have recently disappeared " . He added that he believed the most likely cause for the rapid extinctions to have been glaciation , but by the time he wrote World of Life (1911) he had come to believe those extinctions were " due to man 's agency " .

In 1880 , Wallace published the book Island Life as a sequel to The Geographical Distribution of Animals . It surveyed the distribution of both animal and plant species on islands . Wallace classified islands into three different types . Oceanic islands , such as the Galapagos and Hawaiian Islands (then known as the Sandwich Islands) formed in mid @-@ ocean and never part of any large continent . Such islands were characterised by a complete lack of terrestrial mammals and amphibians , and their inhabitants (with the exceptions of migratory birds and species introduced by human activity) were typically the result of accidental colonisation and subsequent evolution . He divided continental islands into two separate classes depending on whether they had recently been part of a continent (like Britain) or much less recently (like Madagascar) and discussed how that difference affected the flora and fauna . He talked about how isolation affected evolution and how

that could result in the preservation of classes of animals , such as the lemurs of Madagascar that were remnants of once widespread continental faunas . He extensively discussed how changes of climate , particularly periods of increased glaciation , may have affected the distribution of flora and fauna on some islands , and the first portion of the book discusses possible causes of these great ice ages . Island Life was considered a very important work at the time of its publication . It was discussed extensively in scientific circles both in published reviews and in private correspondence .

= = = Environmental issues = = =

Wallace 's extensive work in biogeography made him aware of the impact of human activities on the natural world . In Tropical Nature and Other Essays (1878) , he warned about the dangers of deforestation and soil erosion , especially in tropical climates prone to heavy rainfall . Noting the complex interactions between vegetation and climate , he warned that the extensive clearing of rainforest for coffee cultivation in Ceylon (Sri Lanka) and India would adversely impact the climate in those countries and lead to their eventual impoverishment due to soil erosion . In Island Life , Wallace again mentioned deforestation and also the impact of invasive species . On the impact of European colonisation on the island of Saint Helena , he wrote :

... yet the general aspect of the island is now so barren and forbidding that some persons find it difficult to believe that it was once all green and fertile . The cause of this change is , however , very easily explained . The rich soil formed by decomposed volcanic rock and vegetable deposits could only be retained on the steep slopes so long as it was protected by the vegetation to which it in great part owed its origin . When this was destroyed , the heavy tropical rains soon washed away the soil , and has left a vast expanse of bare rock or sterile clay . This irreparable destruction was caused , in the first place , by goats , which were introduced by the Portuguese in 1513 , and increased so rapidly that in 1588 they existed in the thousands . These animals are the greatest of all foes to trees , because they eat off the young seedlings , and thus prevent the natural restoration of the forest . They were , however , aided by the reckless waste of man . The East India Company took possession of the island in 1651 , and about the year 1700 it began to be seen that the forests were fast diminishing , and required some protection . Two of the native trees , redwood and ebony , were good for tanning , and , to save trouble , the bark was wastefully stripped from the trunks only , the remainder being left to rot ; while in 1709 a large quantity of the rapidly disappearing ebony was used to burn lime for building fortifications !

Wallace 's comments on environment grew more strident later in his career . In The World of Life (1911) he wrote :

These considerations should lead us to look upon all the works of nature , animate or inanimate , as invested with a certain sanctity , to be used by us but not abused , and never to be recklessly destroyed or defaced . To pollute a spring or a river , to exterminate a bird or beast , should be treated as moral offences and as social crimes ; ... Yet during the past century , which has seen those great advances in the knowledge of Nature of which we are so proud , there has been no corresponding development of a love or reverence for her works ; so that never before has there been such widespread ravage of the earth 's surface by destruction of native vegetation and with it of much animal life , and such wholesale defacement of the earth by mineral workings and by pouring into our streams and rivers the refuse of manufactories and of cities ; and this has been done by all the greatest nations claiming the first place for civilisation and religion !

= = = Astrobiology = = =

Wallace 's 1904 book Man 's Place in the Universe was the first serious attempt by a biologist to evaluate the likelihood of life on other planets . He concluded that the Earth was the only planet in the solar system that could possibly support life , mainly because it was the only one in which water could exist in the liquid phase . More controversially he maintained that it was unlikely that other stars in the galaxy could have planets with the necessary properties (the existence of other galaxies not having been proved at the time) .

His treatment of Mars in this book was brief , and in 1907 , Wallace returned to the subject with a book Is Mars Habitable ? to criticise the claims made by Percival Lowell that there were Martian canals built by intelligent beings . Wallace did months of research , consulted various experts , and produced his own scientific analysis of the Martian climate and atmospheric conditions . Among other things , Wallace pointed out that spectroscopic analysis had shown no signs of water vapour in the Martian atmosphere , that Lowell 's analysis of Mars 's climate was seriously flawed and badly overestimated the surface temperature , and that low atmospheric pressure would make liquid water , let alone a planet @-@ girding irrigation system , impossible . Richard Milner comments : " It was the brilliant and eccentric evolutionist Alfred Russel Wallace ... who effectively debunked Lowell 's illusionary network of Martian canals . " Wallace originally became interested in the topic because his anthropocentric philosophy inclined him to believe that man would likely be unique in the universe .

= = Controversies = =

= = = Spiritualism = = =

In a letter to his brother @-@ in @-@ law in 1861 , Wallace wrote :

... I remain an utter disbeliever in almost all that you consider the most sacred truths . I will pass over as utterly contemptible the oft @-@ repeated accusation that sceptics shut out evidence because they will not be governed by the morality of Christianity ... I am thankful I can see much to admire in all religions . To the mass of mankind religion of some kind is a necessity . But whether there be a God and whatever be His nature ; whether we have an immortal soul or not , or whatever may be our state after death , I can have no fear of having to suffer for the study of nature and the search for truth , or believe that those will be better off in a future state who have lived in the belief of doctrines inculcated from childhood , and which are to them rather a matter of blind faith than intelligent conviction .

Wallace was an enthusiast of phrenology . Early in his career , he experimented with hypnosis , then known as mesmerism . He used some of his students in Leicester as subjects , with considerable success . When he began his experiments with mesmerism , the topic was very controversial and early experimenters , such as John Elliotson , had been harshly criticised by the medical and scientific establishment . Wallace drew a connection between his experiences with mesmerism and his later investigations into spiritualism . In 1893 , he wrote :

I thus learnt my first great lesson in the inquiry into these obscure fields of knowledge , never to accept the disbelief of great men or their accusations of imposture or of imbecility , as of any weight when opposed to the repeated observation of facts by other men , admittedly sane and honest . The whole history of science shows us that whenever the educated and scientific men of any age have denied the facts of other investigators on a priori grounds of absurdity or impossibility , the deniers have always been wrong .

Wallace began investigating spiritualism in the summer of 1865 , possibly at the urging of his older sister Fanny Sims , who had been involved with it for some time . After reviewing the literature on the topic and attempting to test the phenomena he witnessed at séances , he came to accept that the belief was connected to a natural reality . For the rest of his life , he remained convinced that at least some séance phenomena were genuine , no matter how many accusations of fraud sceptics made or how much evidence of trickery was produced . Historians and biographers have disagreed about which factors most influenced his adoption of spiritualism . It has been suggested by one biographer that the emotional shock he had received a few months earlier , when his first fiancée broke their engagement , contributed to his receptiveness to spiritualism . Other scholars have preferred to emphasise instead Wallace 's desire to find rational and scientific explanations for all phenomena , both material and non @-@ material , of the natural world and of human society .

Spiritualism appealed to many educated Victorians who no longer found traditional religious doctrine , such as that of the Church of England , acceptable yet were unsatisfied with the

completely materialistic and mechanical view of the world that was increasingly emerging from 19th @-@ century science . However , several scholars who have researched Wallace 's views in depth have emphasised that , for him , spiritualism was a matter of science and philosophy rather than religious belief . Among other prominent 19th @-@ century intellectuals involved with spiritualism were the social reformer Robert Owen , who was one of Wallace 's early idols , the physicists William Crookes and Lord Rayleigh , the mathematician Augustus De Morgan , and the Scottish publisher Robert Chambers .

During the 1860s the stage magician John Nevil Maskelyne exposed the trickery of the Davenport brothers . Wallace was unable to accept that he had replicated their feats utilizing natural methods , and stated that Maskelyne possessed supernatural powers .

In 1874 , Wallace visited the spirit photographer Frederick Hudson . A photograph of him with his deceased mother was produced and Wallace declared the photograph genuine , declaring " I see no escape from the conclusion that some spiritual being , acquainted with my mother 's various aspects during life , produced these recognisable impressions on the plate . " However , Hudson 's photographs had previously been exposed as fraudulent in 1872 .

Wallace 's very public advocacy of spiritualism and his repeated defence of spiritualist mediums against allegations of fraud in the 1870s damaged his scientific reputation . It strained his relationships with previously friendly scientists such as Henry Bates , Thomas Huxley , and even Darwin , who felt he was overly credulous . Others , such as the physiologist William Benjamin Carpenter and zoologist E. Ray Lankester became openly and publicly hostile to Wallace over the issue . Wallace and other scientists who defended spiritualism , notably William Crookes , were subject to much criticism from the press , with The Lancet as the leading English medical journal of the time being particularly harsh . The controversy affected the public perception of Wallace 's work for the rest of his career . When , in 1879 , Darwin first tried to rally support among naturalists to get a civil pension awarded to Wallace , Joseph Hooker responded :

Wallace has lost caste considerably , not only by his adhesion to Spiritualism , but by the fact of his having deliberately and against the whole voice of the committee of his section of the British Association , brought about a discussion on Spiritualism at one of its sectional meetings ... This he is said to have done in an underhanded manner , and I well remember the indignation it gave rise to in the B.A. Council .

Hooker eventually relented and agreed to support the pension request .

= = = Flat Earth wager = = =

In 1870 , a Flat @-@ Earth proponent named John Hampden offered a £ 500 wager (equivalent to about £ 43000 in present @-@ day terms) in a magazine advertisement to anyone who could demonstrate a convex curvature in a body of water such as a river , canal , or lake . Wallace , intrigued by the challenge and short of money at the time , designed an experiment in which he set up two objects along a six @-@ mile (10 km) stretch of canal . Both objects were at the same height above the water , and he mounted a telescope on a bridge at the same height above the water as well . When seen through the telescope , one object appeared higher than the other , showing the curvature of the earth .

The judge for the wager , the editor of Field magazine , declared Wallace the winner , but Hampden refused to accept the result . He sued Wallace and launched a campaign , which persisted for several years , of writing letters to various publications and to organisations of which Wallace was a member denouncing him as a swindler and a thief . Wallace won multiple libel suits against Hampden , but the resulting litigation cost Wallace more than the amount of the wager and the controversy frustrated him for years .

= = = Anti @-@ vaccination campaign = = =

In the early 1880s , Wallace was drawn into the debate over mandatory smallpox vaccination . Wallace originally saw the issue as a matter of personal liberty ; but , after studying some of the

statistics provided by anti @-@ vaccination activists , he began to question the efficacy of vaccination . At the time , the germ theory of disease was very new and far from universally accepted . Moreover , no one knew enough about the human immune system to understand why vaccination worked . When Wallace did some research , he discovered instances where supporters of vaccination had used questionable , in a few cases completely phony , statistics to support their arguments . Always suspicious of authority , Wallace suspected that physicians had a vested interest in promoting vaccination , and became convinced that reductions in the incidence of smallpox that had been attributed to vaccination were , in fact , due to better hygiene and improvements in public sanitation .

Another factor in Wallace 's thinking was his belief that , because of the action of natural selection , organisms were in a state of balance with their environment , and that everything in nature , even disease @-@ causing organisms , served a useful purpose in the natural order of things ; he feared vaccination might upset that natural balance with unfortunate results . Wallace and other anti @-@ vaccinationists pointed out that vaccination , which at the time was often done in a sloppy and unsanitary manner , could be dangerous .

In 1890 , Wallace gave evidence before a Royal Commission investigating the controversy . When the commission examined the material he had submitted to support his testimony , they found errors , including some questionable statistics . The Lancet averred that Wallace and the other anti @-@ vaccination activists were being selective in their choice of statistics , ignoring large quantities of data inconsistent with their position . The commission found that smallpox vaccination was effective and should remain compulsory , though they did recommend some changes in procedures to improve safety , and that the penalties for people who refused to comply be made less severe . Years later , in 1898 , Wallace wrote a pamphlet , Vaccination a Delusion ; Its Penal Enforcement a Crime , attacking the commission 's findings . It , in turn , was attacked by The Lancet , which stated that it contained many of the same errors as his evidence given to the commission .

= = Legacy and historical perception = =

As a result of his writing , at the time of his death Wallace had been for many years a well @-@ known figure both as a scientist and as a social activist . He was often sought out by journalists and others for his views on a variety of topics . He received honorary doctorates and a number of professional honours , such the Royal Society 's Royal Medal and Darwin Medal in 1868 and 1890 respectively , and the Order of Merit in 1908 . Above all , his role as the co @-@ discoverer of natural selection and his work on zoogeography marked him out as an exceptional figure . He was undoubtedly one of the greatest natural history explorers of the 19th century . Despite this , his fame faded quickly after his death . For a long time , he was treated as a relatively obscure figure in the history of science . A number of reasons have been suggested for this lack of attention , including his modesty , his willingness to champion unpopular causes without regard for his own reputation , and the discomfort of much of the scientific community with some of his unconventional ideas .

Recently , he has become a less obscure figure with the publication of several book @-@ length biographies on him , as well as anthologies of his writings . In 2007 a literary critic for New Yorker magazine observed that five such biographies and two such anthologies had been published since 2000 . There has also been a web page created that is dedicated to Wallace scholarship . In a 2010 book , the environmentalist Tim Flannery claimed that Wallace was ' the first modern scientist to comprehend how essential cooperation is to our survival , ' and suggested that Wallace 's understanding of natural selection and his later work on the atmosphere be seen as a forerunner to modern ecological thinking .

The Natural History Museum , London , co @-@ ordinated commemorative events for the Wallace centenary worldwide in the ' Wallace100 ' project in 2013 . On 24 January , his portrait was unveiled in the Main Hall of the museum by Bill Bailey , a fervent admirer . On the BBC Two programme " Bill Bailey 's Jungle Hero " , first broadcast on 21 April 2013 , Bailey revealed how Wallace cracked evolution by revisiting places where Wallace discovered exotic species . Episode one featured orangutans and flying frogs in Bailey 's journey through Borneo . Episode two featured birds of

paradise . On 7 November 2013 , the 100th anniversary of Wallace 's death , Sir David Attenborough unveiled a statue of Wallace at the museum . The statue was donated by the A. R. Wallace Memorial Fund , and was sculpted by Anthony Smith . It depicts Wallace as a young man , collecting in the jungle . November 2013 also marked the debut of The Animated Life of A. R. Wallace , a paper @-@ puppet animation film dedicated to Wallace 's centennial .

= = Awards , honours , and memorials = =

Served as president of the anthropology section of the British Association in 1866 .
Became president of the Entomological Society of London in 1870 .
Elected head of the biology section of the British Association in 1876 .
Elected to the Royal Society in 1893 .
Asked to chair the International Congress of Spiritualists (meeting in London) in 1898 .
In 1928 , a house at Richard Hale School (then called Hertford Grammar School) was named after Wallace . Wallace attended Richard Hale as a student from 1828 to 1836 .
Lecture theatres at Swansea and Cardiff universities are named after Wallace , and a building at the University of South Wales .
Craters on Mars and the Moon are named after him .
In 1986 the Royal Entomological Society of London mounted a year @-@ long expedition to the Dumoga @-@ Bone National Park in North Sulawesi named Project Wallace .
A group of Indonesian islands is known as the Wallacea biogeographical region in Wallace 's honour , and Operation Wallacea , named after the region , awards " Alfred Russel Wallace Grants " to undergraduate ecology students .

= = Writings by Wallace = =

Wallace was a prolific author . In 2002 , a historian of science published a quantitative analysis of Wallace 's publications . He found that Wallace had published 22 full @-@ length books and at least 747 shorter pieces , 508 of which were scientific papers (191 of them published in Nature) . He further broke down the 747 short pieces by their primary subjects as follows . 29 % were on biogeography and natural history , 27 % were on evolutionary theory , 25 % were social commentary , 12 % were on Anthropology , and 7 % were on spiritualism and phrenology . An online bibliography of Wallace 's writings has more than 750 entries .

= = = Selected books = = =

Wallace , Alfred Russel (1853) . Palm trees of the Amazon and their uses . (Biodiversity Heritage Library) . London .
Wallace , Alfred Russel (1869) . The Malay Archipelago . Harper .
Wallace , Alfred Russel (1870) . Contributions to the Theory of Natural Selection (Google Books) (2nd ed .) . Macmillan and Company .
Wallace , Alfred Russel (1876) . The Geographical Distribution of Animals (Google Books) . Harper and brothers .
Wallace , Alfred Russel (1878) . Tropical Nature , and Other Essays (Google Books) . Macmillan .
Wallace , Alfred Russel (1881) . Island Life . Harper and brothers .
Wallace , Alfred Russel (1889) . Darwinism : An Exposition of the Theory of Natural Selection , with Some of Its Applications . Macmillan .
Wallace , Alfred Russel (1889) . Travels on the Amazon and Rio Negro (Google Books) (1889 ed .) . Ward , Lock .
Wallace , Alfred Russel (1904) . Man 's Place in the Universe (Gutenberg) . Chapman & Hall .
Wallace , Alfred Russel (1905) . My Life (Google Books) . Chapman & Hall .

= = = Selected papers = = =

1853 : On the Monkeys of the Amazon . Speculates on the effect of rivers and other geographical barriers on the distribution of closely allied species .
1855 : On the Law Which Has Regulated the Introduction of New Species . Wallace 's thoughts on the laws governing the geographic distribution of closely allied species , including the Sarawak Law , and the implications of those laws for the transmutation of species .
1857 : On the Natural History of the Aru Islands . First methodical biogeographic study .
1858 : On the Tendency of Varieties to Depart Indefinitely From the Original Type . Paper on natural selection sent by Wallace to Darwin .
1859 : On the Zoological Geography of the Malay Archipelago . Contains first description of the Wallace Line .
1863 : Remarks on the Rev. S. Haughton 's Paper on the Bee 's Cell , And on the Origin of Species . Wallace 's defence of the Origin on the topic of evolution of the hexagonal bee cell .
1863 : On the Physical Geography of the Malay Archipelago . Paper on the geography and possible geographic history of Indonesia with concluding remarks on importance of biogeography and biodiversity that are frequently cited in modern conservation circles .
1864 : On the phenomena of variation and geographical distribution as illustrated by the Papilionidae of the Malayan region . Monograph on Indonesian butterfly family with discussion of different kinds of variability including individual variation , polymorphic forms , geographical races , variation influenced by local conditions , and closely allied species .
1891 : English and American Flowers . Contains speculation on how glaciation may have affected distribution of mountain flora in North America and Eurasia .
A more comprehensive list of Wallace 's publications that are available online , as well as a full bibliography of all of Wallace 's writings , has been compiled by the historian Charles H. Smith at the The Alfred Russel Wallace Page .

= = Bird specimens collected by Wallace = =