Alfred Russel Wallace

This great 19th-century naturalist and Charles Darwin simultaneously announced the theory of evolution by means of natural selection. He later went beyond Darwin in applying the theory to human evolution

by Loren C. Eiseley

The year was 1852. Alfred Russel Wallace stood in a leaking longboat of the brig *Helen* over 1,000 miles from the port of Pará and watched almost everything he had collected or thought about through four years in the depths of the Amazon jungle burning before him. Flames leaped from shroud to shroud of the abandoned vessel. Monkeys screamed and ran into the heart of the fire. Fire roared in his collections below decks, and ate at the masts until they fell. Only a single parrot, clinging to a burning rope on the bowsprit, dropped into the sea and was saved.

In the boats the men watched through the night, hoping that the pillar of flame would swing a passing ship out of her course to pick them up. The dawn came, charred and vacant. They were alone on the heaving sea with a limited supply of water and food.

Wallace watched while the captain set a course for Bermuda. The naturalist who was destined to take his place, seven years later, by the side of Charles Darwin as one of the great scientists of all time, ate a biscuit numbly and helped the others bail the leaking boat. If he survived, he would return to England as poor as when he had journeyed out to South America four years before.

He had lost his younger brother Herbert to yellow fever. It might have been better to have stayed and rotted with the other eccentrics in the fever ports of the tropics. There was a luck in these things. It had been with him on the great river and in the camps of half-wild savages, but now, if there should be a storm, if they should be becalmed until the water ran out. . . . Ten days later, on short rations and still 200 miles from Bermuda, the entire crew was picked up by a passing vessel bound for London.

Wallace was, after all, coming home. His luck still held, but it was poor man's luck. He was 29 and the forests and islands of the Malay seas were still ahead of him. There was, perhaps, only one gain: in his long, difficult traverses over the watershed of the world's greatest river, he had come to realize the enormous diversity of life, and how that diversity seemed related to geographic barriers often represented by the confluent fingers of the huge river.

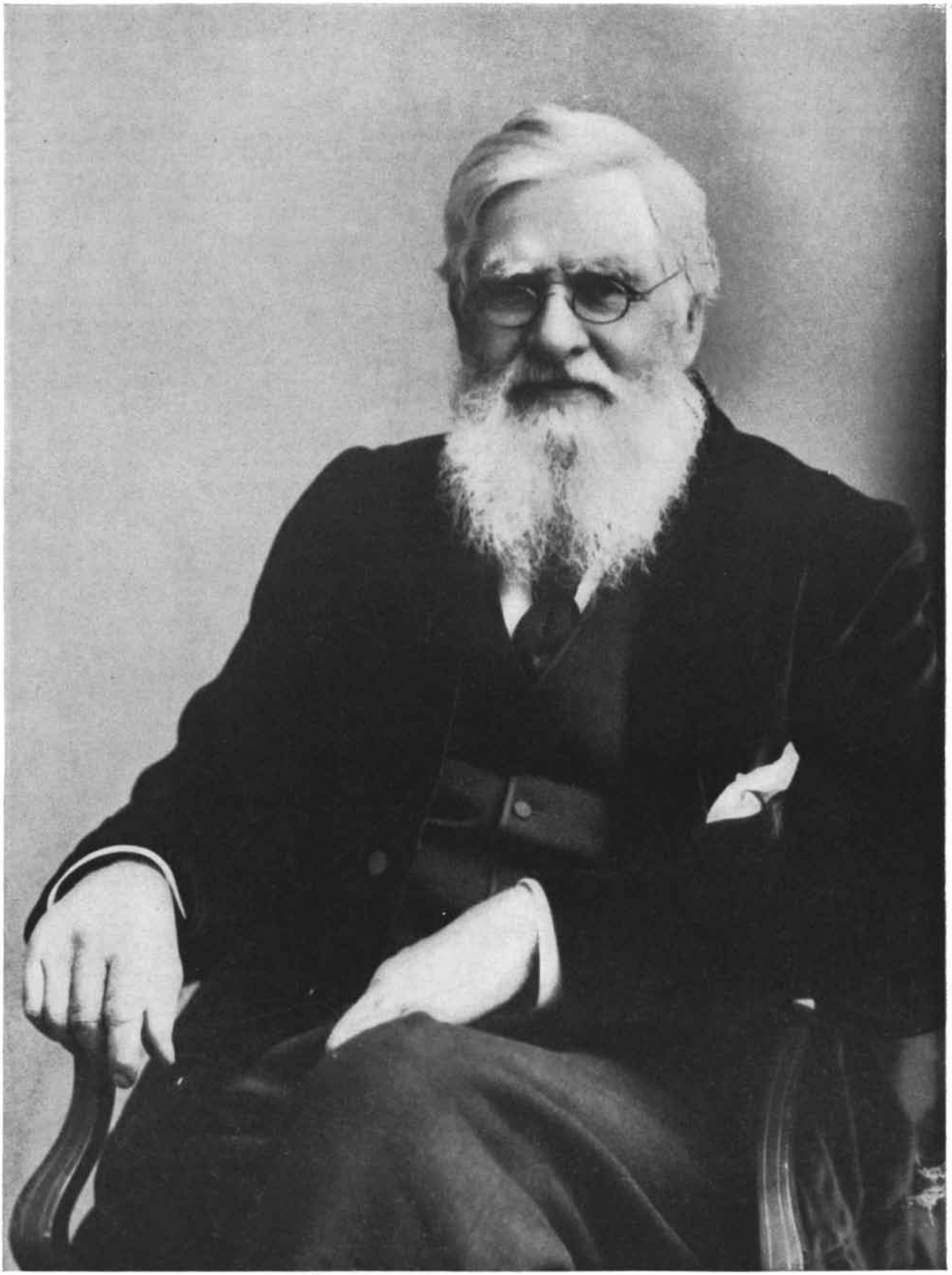
Even the fishes within the river differed. Those of the Amazon were peculiar to itself, but those of the upper tributaries were distinct. The number of separate species inhabiting the Amazon basin, he observed, "must be immense." He wondered a little about all that related diversity. He had read Charles Lyell's *Principles of Geology;* he was also acquainted with Robert Chambers's somewhat crude evolutionary sensation, *Vestiges of the Natural History of Creation*, which had achieved popular success before he left England for South America. A freethinker of sorts, he considered that there might be something in it. In this he differed from experienced and better-trained naturalists who had castigated it as an absurd piece of journalism.

One other thing could be put down to experience. Alone among the great Victorian evolutionists, he had actually lived with primitive men. He had not just gazed at them politely from exploring vessels. He had ventured into the high Amazons; he had visited country untrod by Europeans. He had sweated with naked savages up dangerous river portages. He had drunk at their feasts, slept in their houses, observed every aspect of their lives. There was a touch of the anthropologist as well as the naturalist in Wallace. Later on in the century these anthropological interests would reemerge and leave him somewhat isolated from his fellows. But now the Amazons had been left behind him. To what would he turn?

Early Life

In the history of that little band of men who, in the mid-19th century, swung biological thought into evolutionary channels, Alfred Russel Wallace occupies a unique position. Unlike Thomas Huxley, the brilliant, versatile debater, or Joseph Hooker, the perceptive botanist, or Lyell, the dreaming, elegant writer who was one of the founders of modern geology, Wallace independently achieved and set forth the same ideas as Darwin. He was an independent discoverer of natural selection. If it had not been for the mere chance that he chose to dispatch the account of his discovery to Darwin, we might today be acclaiming Wallace, rather than Darwin, as the founder of modern biology.

In this centennial year of 1959, 100 years since the publication of Darwin's *Origin of Species*, innumerable addresses will extol the scientific achievements of Darwin. Wallace, on the other hand, will be present in many of these historical accounts only as an attenuated shadow—a foil to the great Darwin. Many will not know his name, or, if they recognize it, will do so only with the vague impression that Wallace found out something which Darwin had already perceived more clearly. The fact that Wallace emerged from a social class different from Darwin's, that he was not a product of the traditional schools, has perhaps militated subtly against the full recognition of his scientific achievements. Moreover, Wallace, by nature modest and retiring, never thrust himself forward and his contributions have in some cases



WALLACE was born in 1823 and lived until 1913. From 1848 to 1862 he traveled widely in the valley of the Amazon and in the islands of Indonesia. This photograph of him was made in 1885, when he was 62. The photograph is from the Gernsheim Collection.

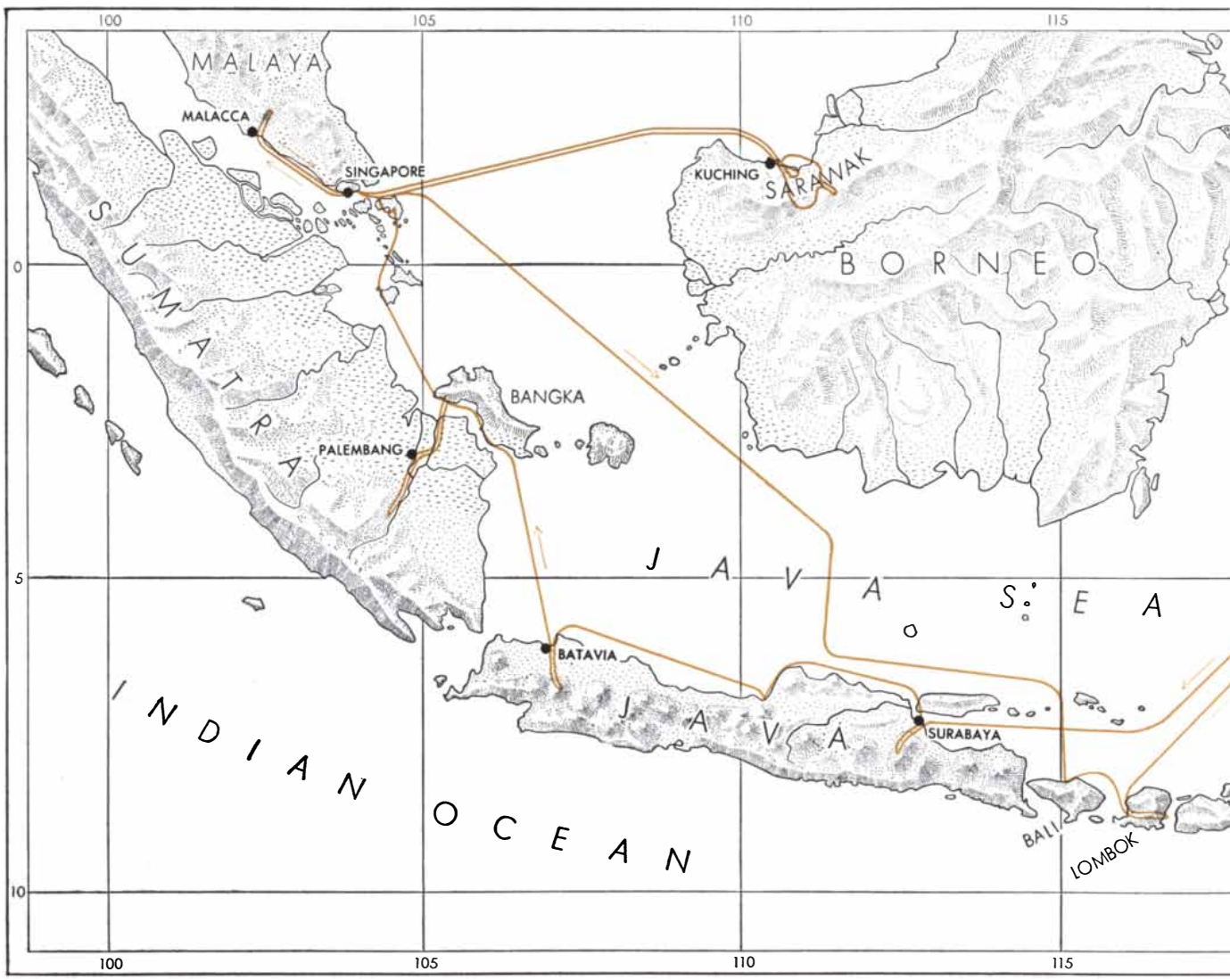
passed into the body of scientific thought without acknowledgment.

He belonged to no cliques, and avoided participation in virulent scientific and theological disputes. In terms of his later life he can be classed with Asa Gray in America as one of the more theistically inclined evolutionists who paved the way for the widespread theological acceptance of evolution in the later years of the century. The Darwinists varied individually in their attitudes toward orthodox religion. Wallace, in this regard, we might describe as far to the right of Huxley. While these philosophical matters are not really germane to our account of Wallace's scientific life, it is necessary to mention them because they play a part in certain episodes of his later years.

Wallace survived to be almost 91. In a world where human generations are short, this means that Wallace lived on into a world increasingly alien and strange to him. In some ways he found himself old-fashioned; in other ways, percipient of the future. He ranged farther in his mind and in his interests than his more contained and scientifically orthodox colleagues. Sometimes this habit led to highly successful insights, sometimes to disastrous failures, but through all his vicissitudes one is conscious of being in the presence of a fertile and inquiring mind.

Wallace was born on January 8, 1823, in the Welsh village of Usk in Monmouthshire. In this remote district of low rents and country food his parents had sought refuge from a series of financial misfortunes which had brought them to the verge of total poverty. His father appears to have been a well-intentioned but somewhat inept middle-class gentleman who by degrees had lost most of a small but comfortable inheritance. Although the family had thus fallen upon evil days before Wallace was born, it is worth noting that his father had had a good education, and was fond of books. As Wallace himself observes: "Through reading clubs or lending libraries we usually had some of the best books of travel or biography in the house." Moreover, his father was addicted to reading aloud to his wife and children in the evenings.

Before Wallace was 14, however, he had left home, and he saw little of his parents thereafter. Most of his formal



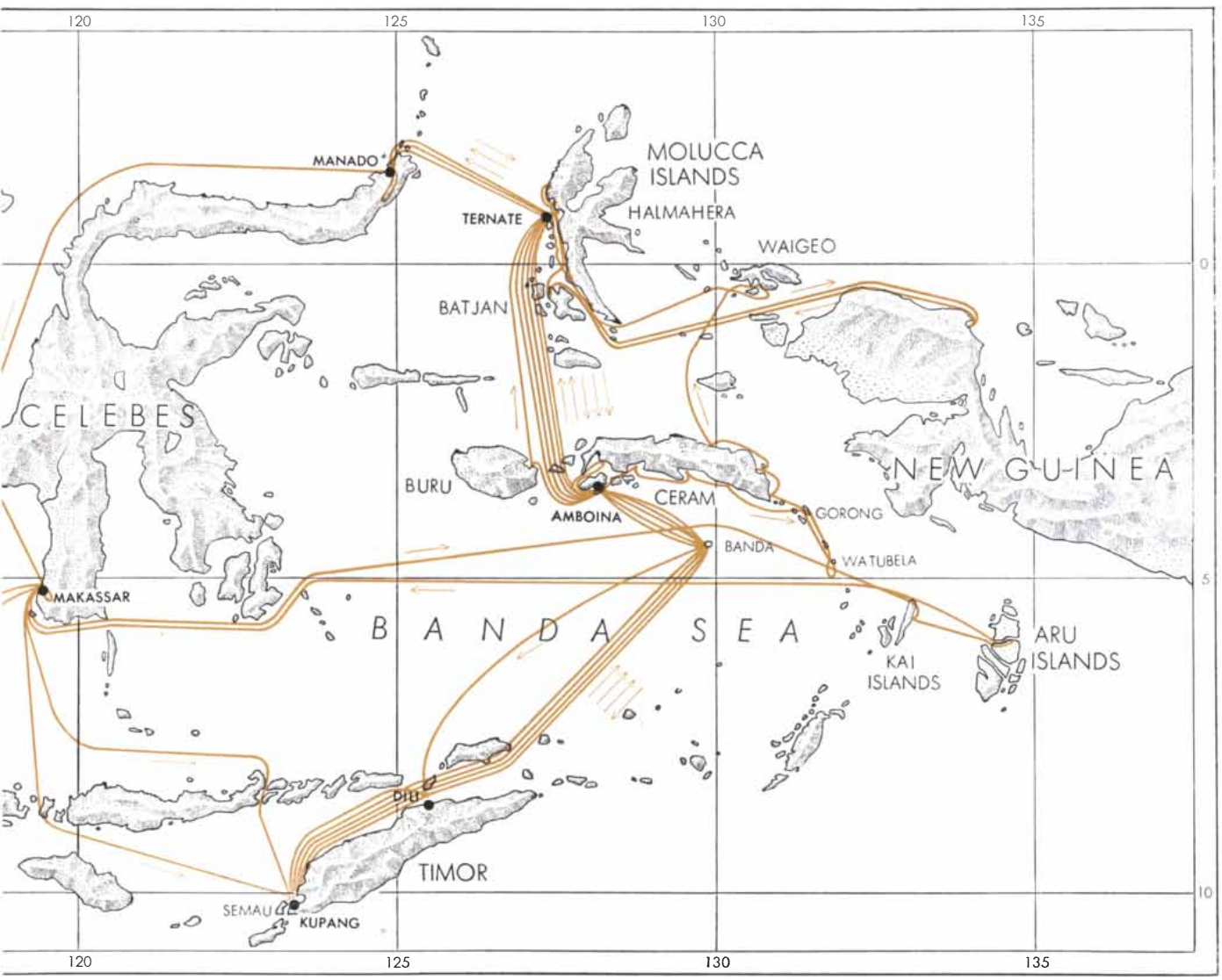
WALLACE'S TRAVELS in Indonesia, then called the Malay Archipelago, are traced in color on this map. He arrived in the Archipelago in 1854, and stayed until 1862. He referred to this period as "eight years of wandering . . . which constituted the central and

schooling, which was scant, had been obtained in the grammar school of the old town of Hertford. He remembered into old age and with great affection the meadows beyond the town, and the mill-stream with its great, dripping water-wheel. In the law courts where the assizes were held he heard the trials of poor sheep-stealers who, in those days, might be liable to transportation for life. Such painful scenes were part of the harsh criminal code so vividly pictured in W. H. Hudson's *A Shepherd's Life*. Wallace never forgot these episodes. They are a strong element in his sympathy for the socially deprived and unfortunate which sets Wallace's thinking so apart from that of many of his Victorian colleagues. He never shared the enthusiasm of some of them for unrestricted struggle within the social world of man.

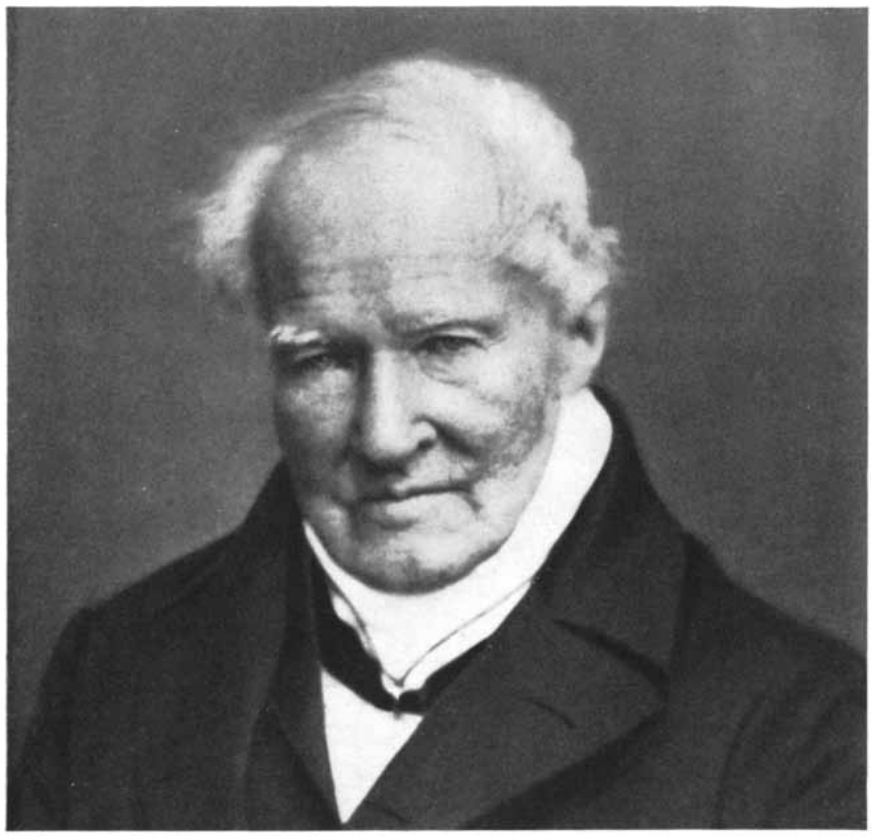
In 1837, after further family financial disasters, Wallace went to London, where he lived for a brief period with his older brother John. He was waiting for the return of another brother, William, from whom he was to learn surveying. Here he wandered about the marvelous streets of London, gazing into the newly installed plate-glass windows of the best shops, attending workingmen's lectures, and reading Thomas Paine's *Age of Reason*. Then, after a glimpse of this metropolitan fairyland, he went back into the country to become a surveyor. Here, a little like William Smith, the surveyor who had discovered the principles of stratigraphy only a few decades earlier, Wallace discovered the many fascinations of geology.

In the country around Barton, near the North Downs, between intervals of application to surveying, he wandered among streams and valleys bearing such appellations as Roaring Meg and the Devil's Dyke. He saw fossils lodged in ancient strata; he rambled in solitary fashion over a wild landscape of which he felt himself increasingly a part. In spite of Wallace's modest protestations in after years that his discovery bore about the same relation to Darwin's achievement as "one week to 20 years," one can observe that the same deep sense of kinship with nature, the same type of prolonged and thoughtful observation, had inspired both men.

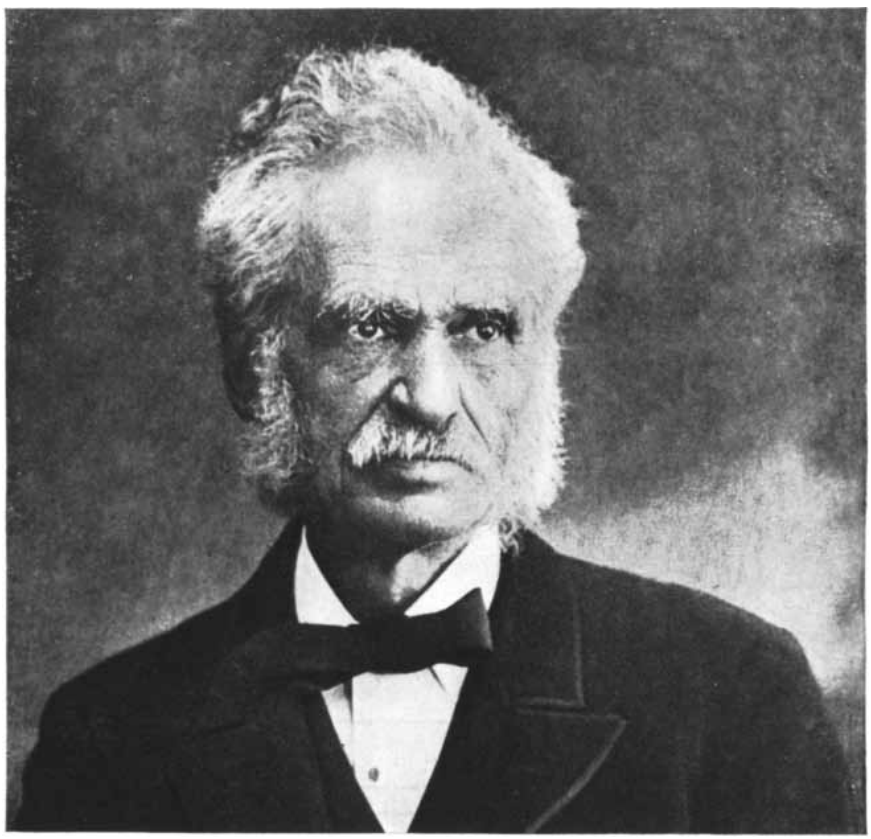
Poor though Wallace was, accident had led him to an occupation which had



controlling incident of my life." In 1858, while lying ill of a fever at Ternate in the Molucca Islands, he formed his concept of evolution by natural selection. He sent a paper on his concept to Charles Darwin a year before Darwin published his *Origin of Species*.



ALEXANDER VON HUMBOLDT wrote *Personal Travels in South America*, which, with Thomas Malthus's *An Essay on the Principle of Population*, influenced the young Wallace.



HENRY WALTER BATES traveled with Wallace. Wallace wrote him: "I should like to take some one family to study . . . with a view to the theory of the origin of species."

enticed him into the open instead of confining him to a shop. It is not without historical interest that in the same period a great literary naturalist, Henry David Thoreau, had in America chosen a similar profession. Contemplating a mountain journey of his surveying years, Wallace once remarked: "We obtain an excellent illustration of how nature works in moulding the earth's surface by a process so slow as to be almost imperceptible."

It was in this pursuit that Wallace spent the years that most young men of today give to high school and college. Nevertheless it was in many ways one of the happiest periods of the great naturalist's life. He was with a responsible older brother whom he loved and who cared for him with great tenderness. He was out in the open air, living a frugal but healthy existence. As he himself tells us, "If I had continued to be similarly employed after I became of age, I should most probably have become entirely absorbed in my profession. It seems unlikely that I should have ever undertaken a journey to the almost unknown forests of the Amazon."

In 1843 Wallace's father died; his brother, having no work in prospect, was forced to advise the youth that he must look out for himself. Once more Wallace drifted to London. He tells us that he was shy, frail and lacking in physical courage. Sensitive and a lover of solitude he undoubtedly was, but we must entertain reservations about his confession of cowardice. For this was the young man who, like the great English voyagers before him, was later to wander alone into the depths of the Amazon forest or venture by native *prau* among the dangerous islands of the Malayan seas. As his friend James Marchant stated, "Wallace, at no time during these wanderings, had any escort or protection, having to rely entirely upon his own tact and patience, combined with firmness, in his dealing with the natives."

In 1844 Wallace obtained a small teaching post in a school at Leicester, where he stayed for a little over a year. Here in a good town library he continued his own reading interests, including Alexander von Humboldt's *Personal Travels in South America* and Thomas Malthus's *An Essay on the Principle of Population*, which had also influenced Darwin. Years later, referring particularly to Humboldt, Joseph Hooker wrote to Darwin: "I think Humboldt is underrated nowadays. Well, these were our Gods, my friend, and I still worship at their shrines a little." In this wistful

phrase Hooker has caught the essence of a bygone day. Humboldt, the great traveler, had had an influence on the youthful naturalists of Darwin's and Wallace's time which can only be compared to Linnaeus' great influence in the 18th century.

It can already be seen that, although they were separated by a vast social distance, Darwin and Wallace had pretty much the same reading background, except that Wallace had a greater concern for social movements and perhaps a deeper and more intense interest in the study of man. Both had been stimulated by their scientific predecessors, Lyell and Humboldt. Darwin had already made his voyage and was working secretively at Down while Wallace, 14 years younger, was still teaching children to read. No one could possibly have imagined that this unpromising, unlettered young schoolteacher would catch up to, and share honors with, the greatest biologist of the age, but so it was to be.

In the town library of Leicester, Wallace met and became fast friends with Henry Walter Bates, the entomologist with whom he was later to journey to South America. The death of William Wallace caused Alfred to resign his teaching position, and to move for a brief period to Neath. Wallace continued to correspond with Bates, however, and together they began to dream of a tropical collecting expedition.

The young men's letters reveal that both were greatly stimulated by Chambers's *Vestiges of the Natural History of Creation*, to which I have previously referred. "I begin to feel dissatisfied," Wallace wrote to Bates, "with a mere local collection. I should like to take some one family to study thoroughly, principally with a view to the theory of the origin of species."

These words were written 12 years before the *Origin of Species* was published. Wallace had read Darwin's *Journal of Researches;* he had also read the *Vestiges*. "I have rather a more favorable opinion of the *Vestiges* than you appear to have," Wallace wrote his friend Bates, and from then on his attention to the problem of evolution never wavered. Moreover, it is pleasing to record that, unlike some of the later Darwinists, he never abused Chambers. "The *Vestiges* is a book," he said in later years, "which has always been undervalued." He knew well that it had been a vital stimulus to many.

In the end, nevertheless, it was to be an American, William Henry Edwards, who was to center the plans of Bates and Wallace upon the Amazon as their first great adventure. In 1847 they chanced to read Edwards's book entitled *A Voyage up the River Amazon*. "The whole region north of the Amazon," wrote Edwards, himself a naturalist and collector of no mean descriptive powers, "is watered by numberless rivers, very many of which are still unexplored. It is a sort of bugbear country, where cannibal Indians and ferocious animals abound to the destruction of travelers. This . . . has always been Fancy's domain."

Scarcely had Wallace and Bates perused the book—with its accounts of rare animals, birds and insects, its observation of "monkeys who vary in species with every degree of latitude or longitude"—when the young naturalists hastened to the British Museum for advice. Here they were assured that the whole of northern Brazil was very little known and that collections made there would easily pay the expenses of the trip. By chance they discovered that Edwards was visiting London. Accordingly Bates and Wallace called upon him. He encouraged them in their ambitions and gave them letters to some of his friends in Pará. There was wide enthusiasm for natural-history collections among the well-to-do in these years, and the young men were fortunate in securing a reliable agent to handle their collections and keep them informed of the market. Early in April of 1848 they sailed in the bark *Mischief* for Pará.

Their initiation to life at sea was remarkably like that of Darwin's on the *Beagle*. Soon after they put to sea they were beset by a violent storm. Part of their bulwarks was carried away, and the ship almost foundered. For a week Wallace lay desperately ill from seasickness. Finally the storm passed and the ship had fine sailing weather for the rest of the voyage. Wallace was to remember into old age the exquisite blue of the tropic sea by day, and the shining phosphorescence of the ship's wake by night.

When they went ashore in Pará, he was awed and inspired, as Darwin had been, by the primeval forest. "Here," he wrote, "no one who has any feeling of the magnificent and sublime can be disappointed; the sombre shade, scarce illumined by a direct ray even of the tropical sun, the enormous size and height of the trees, most of which rise like huge columns a hundred feet or more without throwing out a single branch, the strange buttresses around the base of some, the spiny or furrowed stems of others, the curious and even extraordinary creepers and climbers which wind around them, hanging in long festoons from branch to branch, sometimes curling and twisting on the ground like great serpents, then mounting to the very tops of the trees, thence throwing down roots and fibres which hang waving in the air or twisting round each other, form ropes and cables of every variety of size and often of the most perfect regularity. These, and many other novel features—the parasitic plants growing on the trunks and branches, the wonderful variety of foliage, the strange fruits and seeds that lie rotting on the ground—taken altogether surpass description. . . . Here lurk the jaguar and the boa-constrictor, and here amidst the densest shade the bell-bird tolls his peal."

This was to be Wallace's world for the next four years; a world where gecko lizards walked upside down on one's ceiling, where one's spoons, cups and bottles were made from gourds, where tree frogs were as gaily colored as children's toys, and where through the vast, illimitable forests the only thoroughfares were the enormous rivers emerging out of the unknown and hurrying with all manner of natural wreckage toward the sea. The spoonbill and the scarlet ibis stalked in the shallows. Overhead in the forest attic flew shrieking parrots. Innumerable monkeys, astonishing little caricatures of men, contemplated life while hanging by the ends of their prehensile tails from that same refuge. It was a world where the floods of the great rivers and the dimness of the forest had driven life to the upper levels of the branches.

As for man, whether primitive or civilized, the waterways were his only grasp upon reality, his only means of orientation, even his only means of emerging into the sun. For four years Wallace was to be a wandering corpuscle along the muddy arteries of a continent. At the end of that time, and after the loss of the young brother who had bravely come out to join him in 1849, Wallace decided to return home. "My health," he observed in his autobiography, "had suffered so much by a succession of fevers and dysentery that I did not consider it prudent to stay longer." Bates, his companion of the outward voyage, stayed for seven years more, producing in 1863 *The Naturalist on the River Amazons*, now a great English classic.

Travels in Malaya

We have already seen under what circumstances Wallace reached home in 1852. Coming ashore with nothing but the clothes he stood in, he sought refuge

in the family of a married sister, and for the next 18 months busied himself with a book of his own travels on the Amazon and the Río Negro. He also composed a now-rare little book on palm trees, based on sketches which he had salvaged from the wreck. A small sum of insurance, through the foresight of his agent, helped him. "Fifty times," he wrote to a friend, "I vowed never to trust myself more on the ocean. But good resolutions soon fade and I am already only doubtful whether the Andes or the Philippines are to be the scene of my next wanderings." The tropics had got into his blood.

By now Wallace was reasonably well known to naturalists through his constant attendance at the meetings of the Zoological and Entomological societies in London. After much careful collecting of information from fellow-travelers and scientists, he came to the conclusion that the Malay Archipelago offered excellent opportunities for an exploring naturalist who had to live by his collections. The islands were regarded as healthier than the Amazon, and Wallace determined to go there if he could secure free passage in some Government ship. Through the representations of Sir Roderick Murchison, then president of the Royal Geographical Society, this request was granted by the Government. The fact is worth noting because it indicates that the 30-year-old author of two books was already favorably known in scientific circles before he left for the jungles of the East.

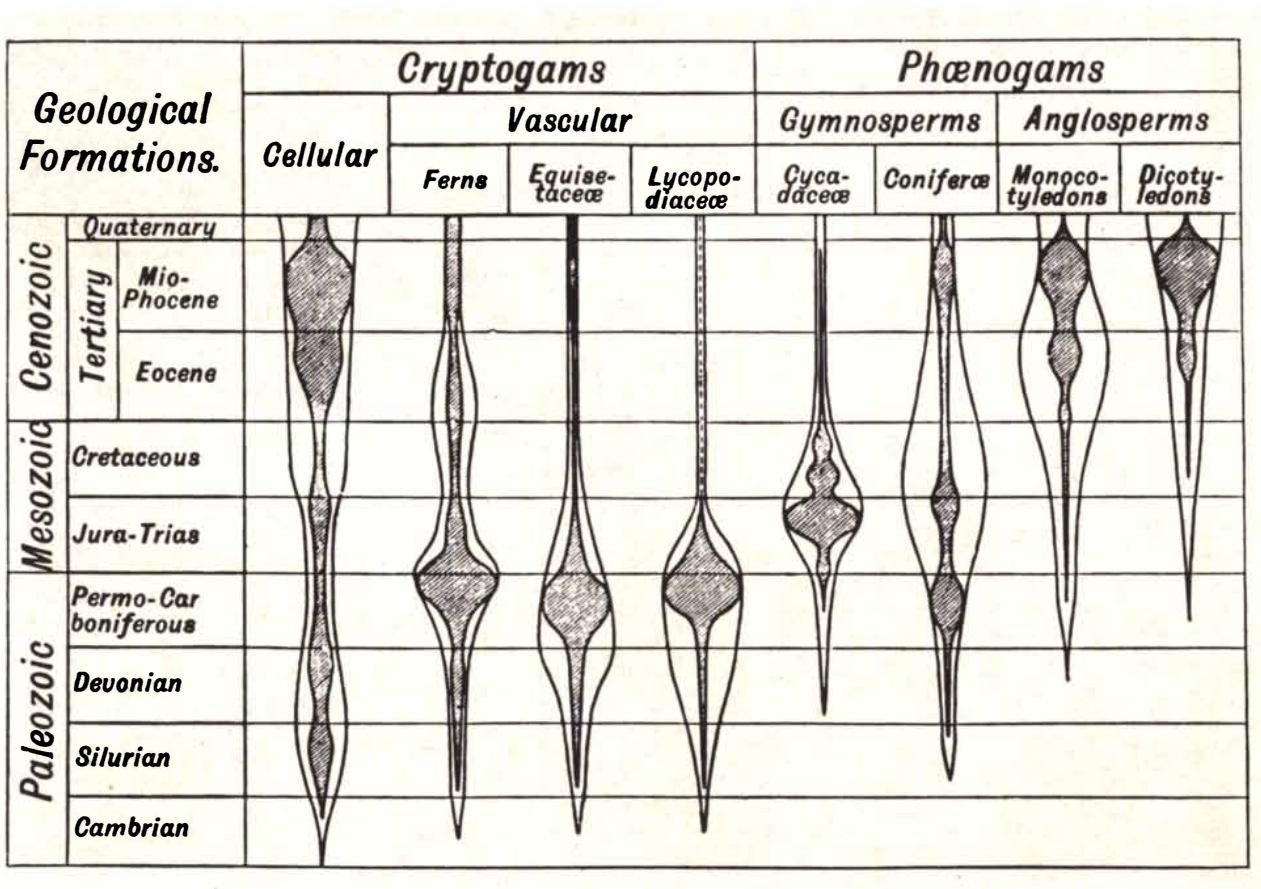
In April of 1854 he had reached Singapore with a young English assistant whom he had brought out with him. Behind them lay Suez. This was before the days of the canal, and Wallace in a letter gives a vivid picture of the journey across the neck of the isthmus in horse-drawn omnibuses along a desert road littered with the bones of camels. It was from Singapore, however, that, as Wallace himself wrote afterwards, "I was to begin the eight years of wandering throughout the Malay Archipelago, which constituted the central and controlling incident of my life."

"Singapore is rich in beetles," he exulted in a letter home, for beetles were a favorite collector's item. "I shall have a beautiful collection of them." The assistant, Charles, he confides, "is doing the flies, wasps and bugs. I do not trust him yet with beetles."

In Malacca he suffered again from fever. "I went to the celebrated Mount Ophir and ascended to the top, sleeping under a rock. The walk there was hard work, thirty miles through jungle in a succession of mud-holes, and swarming with leeches which crawled all over us and sucked when and where they pleased. . . . I got some fine new butterflies there and hundreds of other new or rare insects. Huge centipedes and scorpions, some nearly a foot long, were common."

He speaks in turn and with equal interest and affection of tigers and pitcher plants, orangutans and birds of paradise. "The more I see of uncivilized people," he wrote in a fashion of which more would be heard later, "the better I think of human nature on the whole, and the essential differences between civilized and savage man seem to disappear."

Over the map of Indonesia the spidery lines of his travels lengthened year by year. Marchant, his editor and biographer, records that during the eight years of his eastern sojourn he traveled some 14,000 miles within the Archipelago and collected well over 125,000 specimens. He was the first Englishman to see birds



EVOLUTION OF PLANTS is outlined in this chart reproduced from Wallace's book *Darwinism*. The major groups of plants are at the top of the chart; the geological formations are at left. The hatched areas show the abundance of each group in each formation.

of paradise in their natural habitat. He almost fainted with excitement and esthetic delight when he captured one of the rare bird-winged butterflies of iridescent green.

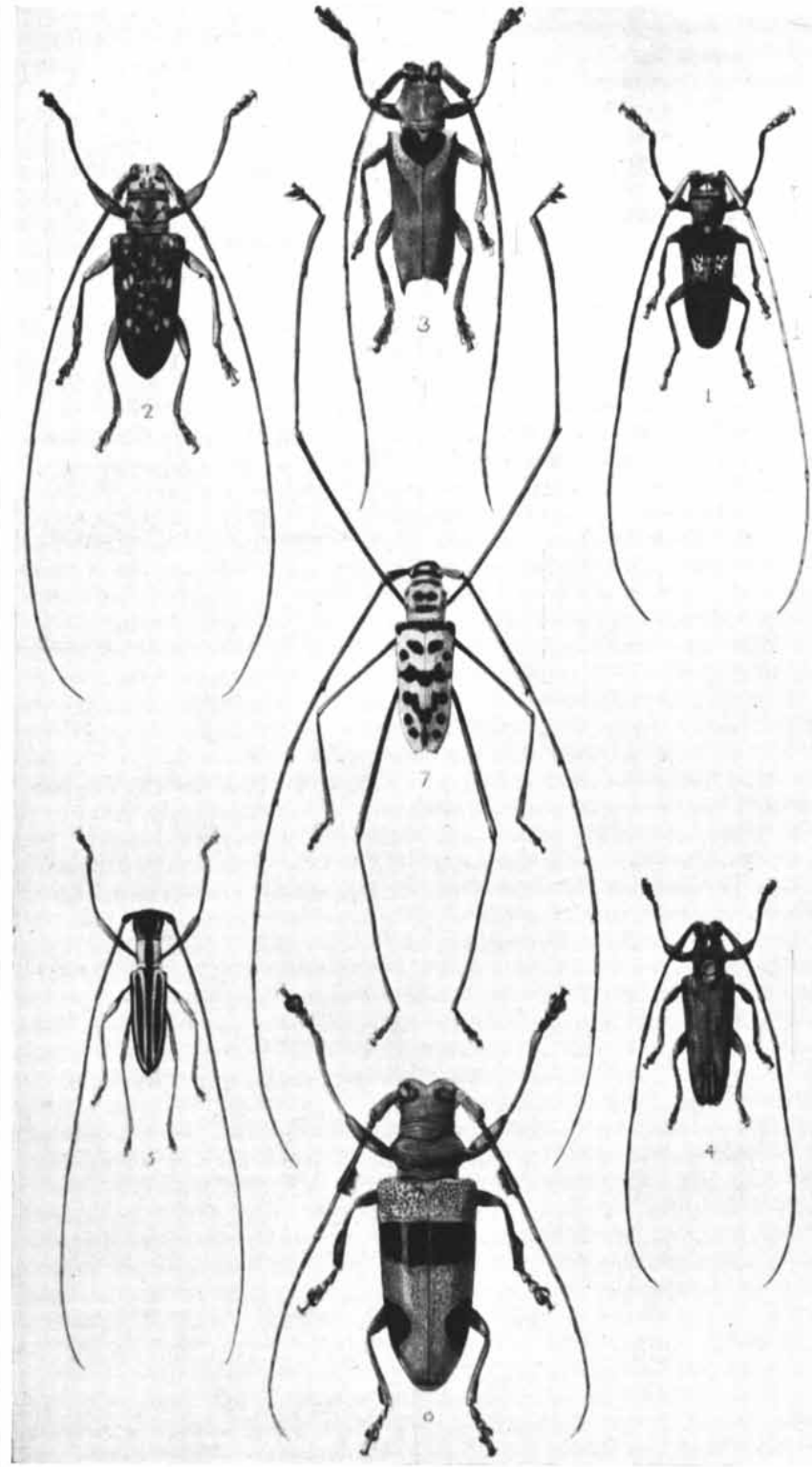
Yet if this last should suggest to some minds an effeminate character, let this record of a single journey in a Malay sailing vessel suffice to reveal the iron in Wallace: "My first crew ran away; two men were lost for a month on a desert island; we were ten times aground on coral reefs; we lost four anchors; our sails were devoured by rats, the small boat was lost astern; we were thirty-eight days on the voyage home which should have taken twelve; we were many times short of food and water; we had no compass lamp owing to there not being a drop of oil in Waigiou when we left; and to crown it all, during the whole of our voyage, occupying in all seventy-eight days, we had not one single day of fair wind."

This voyage was but one of the many of which he writes about "laying in stores, hiring men, paying or refusing to pay their debts, running after them when they try to run away, going to the town with lists of articles *absolutely necessary* for the voyage, and finding that none of them could be had for love or money, conceiving impossible substitutes and not being able to get them either." Nevertheless he can turn from these tribulations to say to his brother-in-law: "Your ingenious arguments to persuade me to come home are quite unconvincing. I have much to do yet. I am engaged in a wider and more general study—that of the relations of animals to space and time." During this period of deep thought he also wrote to a boyhood friend, George Silk: "You cannot imagine how I have come to love solitude. I seldom have a visitor but I wish him away in an hour."

Although Wallace appears to have been a believer in the general principle of evolution since the time of the *Vestiges*, it was here in Malaya, amidst fever and the long indoor days of the rainy season, that Wallace began to marshal the thoughts that would place him beside Darwin. Wallace was tremendously interested in plant and animal distribution. He studied William Swainson and Humboldt. He now had had experience in both the New World and Old World tropics. The question of the origin of species, he tells us, "was rarely absent from my thoughts." Traveler though he was, he carried books with him. "The great work of Lyell," he remarks in his autobiography, "had furnished me with the main features of the succession of

species in time." By combining Lyell's observations with the facts of animal distribution, Wallace thought that "valuable conclusions might be reached." In thus using data from more than one field he was revealing the same great synthesizing power which had stimulated the mind of Darwin.

While visiting Borneo in 1854 and 1855 he prepared a paper "On the Law which Has Regulated the Introduction of New Species." He sent it to the *Annals and Magazine of Natural History*, where it was published in September of 1855. "Every species," Wallace wrote as his principal conclusion, "has come into ex-



BEETLES COLLECTED BY WALLACE in the Malay Archipelago appear in *Transactions of the Entomological Society*. Wallace traveled mainly to gather specimens for collectors.

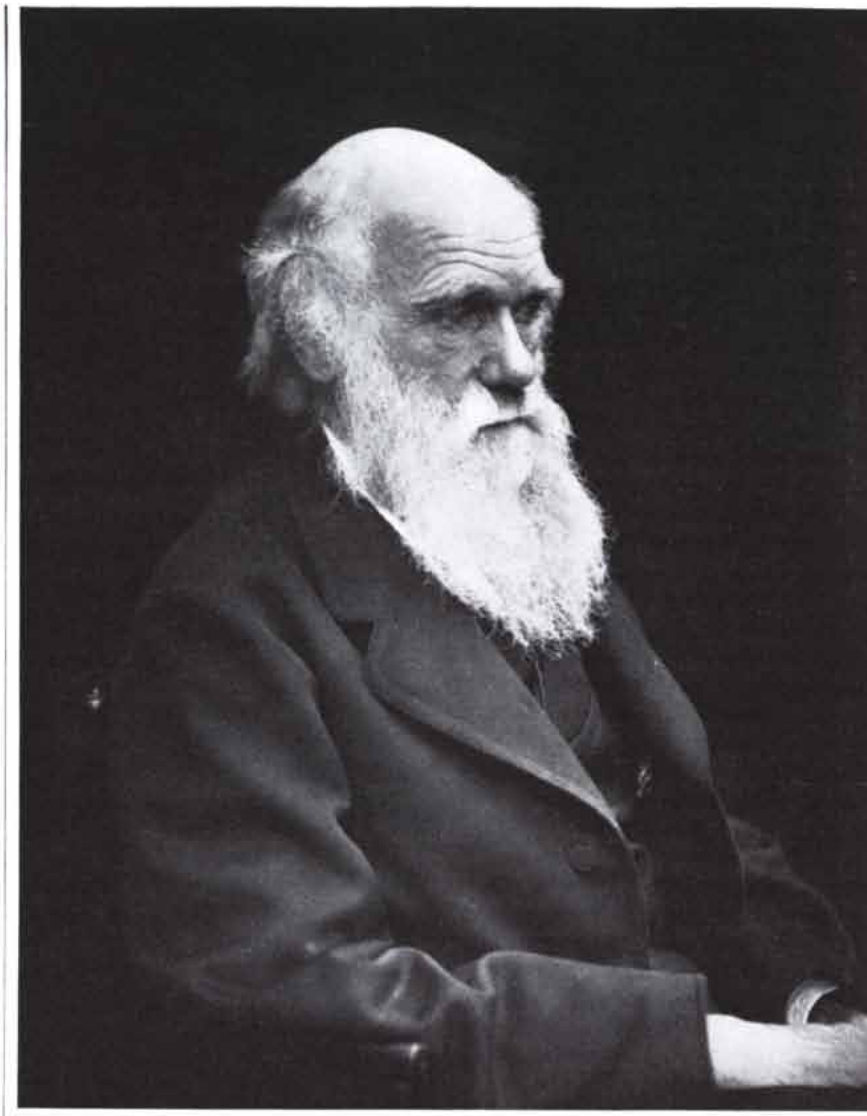
istence coincident both in space and time with a pre-existing closely allied species." This principle is not, of course, Darwinian natural selection, but it points to the fact that only organic change in time could explain such a close connection between the life of the present and that of the past. It was another way of driving home the fact that biological evolution was the only rational explanation for linking living forms with related extinct fossils.

Wallace was not, of course, quite as original as he thought when he wrote this paper. The idea has a long history running back through Darwin to John Hunter, but there was no way for the young Wallace, far from the great libraries, to realize this. Furthermore, the older statements of the principle are less precise. Wallace had a gift for clear, incisive statement, and it emerges in this, his first evolutionary paper. The young naturalist was disappointed when the article passed almost unnoticed. Darwin, with whom he had now had some correspondence, comforted him. Lyell and Edward Blyth, the great student of the South Asian faunas, Darwin wrote, had both called it to his attention.

Once more Wallace turned to the practicalities of the sea and the islands, setting forth on a search for birds of paradise. There is evidence, however, that a rarer, wilder search was by then running in the huntsman's head. In 1858 he referred once more to his paper. "It is," he wrote to his old friend Bates, "merely the announcement of the theory, not its development." He goes on: "I have been much gratified by a letter from Darwin. He is now preparing his great work on 'Species and Varieties,' for which he has been collecting materials twenty years." The letter indicates that he had no notion of Darwin's theory, though he looked forward to its publication with curiosity. Just two months later the huntsman had stumbled upon his quarry. In the mind of the solitary wanderer the present had become one with the past.

Fever and Discovery

During the early months of 1858 Wallace was living at Ternate in the Molucca Islands off the western tip of New Guinea. He was suffering severely from intermittent fever, and during one of these attacks, while lying weak but lucid on his bed, his mind began to revolve upon the "species problem" which had fascinated him since those days when he had read the *Vestiges*. "Something," he says, "brought to my recollection Mal-



DARWIN was stimulated to publish *Origin of Species* when Wallace sent him his paper on the theory of evolution by means of selection. Darwin wrote: "I would far rather burn my whole book than that he or any other man should think I had behaved in a paltry spirit."

thus's *Principle of Population* which I had read about twelve years before."

Suddenly it occurred to the feverish naturalist in a lightning flash of insight that Malthus's checks to human increase —accident, disease, war, and famine— must, in similar or analogous ways, operate in the natural world as well. "Vaguely thinking over the enormous and constant destruction which this implied, it occurred to me," he tells us, "to ask the question, 'Why do some die and some live?' " The answer, Wallace felt, was clear: the best fitted live. "From the effects of disease the most healthy escaped; from the enemies the strongest, the swiftest, or the most cunning; from famine, the best hunters."

Again his mind leaped forward. "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; and as great changes in the environment are always slow, there would be ample time for the change to be effected by the survival of the best fitted in every generation."

It was Darwin's unpublished conception down to the last detail, independently duplicated by a man sitting in a hut at the world's end.

"I waited anxiously for the termination of my fit," Wallace goes on with unconscious humor, "so that I might at once make notes for a paper." In two evenings he was ready to dispatch it to Darwin. "I hoped," he said, "that the idea would be as new to him as it was to me." In this he was sadly disappointed.

The paper reached Darwin at Down

in June of 1858. Wallace's innocent elation was to be Darwin's despair. "All my originality, whatever it may amount to, will be smashed," Darwin wrote to Lyell on the same day. "I never saw a more striking coincidence. . . . Your words [here Darwin was referring to earlier warnings by Lyell that he might be anticipated] have come true with a vengeance."

In a genuine agony of spirit Darwin sought the advice of his friends. Could he now publish honorably? "I would far rather burn my whole book," he protested, "than that he or any other man should think that I had behaved in a paltry spirit."

Wiser counsels prevailed. Darwin, fortunately, had a copy of a letter sent to Asa Gray at Harvard College, which validated his priority. After much self-questioning by Darwin and judicious consideration by Lyell and Hooker, it was decided to read Wallace's paper along with Darwin's letter to Gray and an extract from his unpublished sketch of 1844, before a meeting of the Linnaean Society on July 1, 1858. This was the dramatic prelude to the great intellectual storm which would shake the latter half of the 19th century and be reflected in the Scopes trial of the 1920s here in the U. S. [see "A Witness at the Scopes Trial," by Fay-Cooper Cole; SCIENTIFIC AMERICAN, January].

Yet the beginning was deceptively quiet. Wallace was traveling among the islands, unaware of fame, lost in a dream of rare birds and rarer butterflies. Darwin, who did not attend the meeting, was nursing a sick child. There was no discussion before the Society. "The interest," Hooker commented later, "was intense, but the subject was novel."

The Fellows of the Society were overawed by the tacit approval of such prominent scientists as Hooker and Lyell. The storm, the controversies, would come later with the publication of the *Origin of Species* in the following fall of 1859. Wearily Darwin picked up his pen once more, but finally, in better humor, he wrote to Hooker, "I find it amusing and improving work. I am now most heartily obliged to you and Lyell for having set me on this. I confess I hated the thought of the job."

A man pursuing birds of paradise in a remote jungle did not yet know that he had forced the world's most reluctant author to disgorge his hoarded volume, or that the whole of Western thought was about to be swung into a new channel because a man in a fever had felt a moment of strange radiance. The path led on. It always did for Wallace. In

1862, aware now, in some degree, of the change in his fortunes, he turned homeward. Two roach-eating birds of paradise were his companions. Wallace has unwittingly left us a vivid picture of sea travel in his time. "Every evening," he explains, "I went to the storeroom in the fore part of the ship where I was allowed to brush the cockroaches into a biscuit tin." At Malta a bakery supplied the roaches. The birds and Wallace arrived home in good health.

Views on Man

"I am convinced," Wallace used to contend to his old friend Silk, "that no man can be a good ethnologist who does not travel, and not *travel* merely, but reside as I do; months and years with each race." This statement is a revelatory one. It shows, as does his youthful writing about his experiences in Wales, an intense interest in human beings. He was fascinated by their cultural habits, and the tenor of the remarks I have just quoted indicates that he was aware very early in the history of anthropology of the importance of direct field observation in foreign cultures.

This interest in human behavior is far more intense than one finds it to be among others of the Darwinian circle. In this respect Wallace was a more able anthropologist than Darwin. It is not without significance, therefore, that when the two men came to differ—and differ they eventually did—it was over man that their disagreement arose.

Darwin, in the *Origin of Species,* had avoided the subject of human evolution as tinged with emotion and prejudice. After the success of his book, however, it was inevitable that man would become a prime topic of discussion among all concerned with the new doctrines. Lyell wrote a cautious volume (1863) dealing with human antiquity, which disappointed Darwin. Huxley treated the anatomical aspects of man's relationship to the primates (1863), and Darwin himself was engaged with the preparation of his *Descent of Man,* which was not published until 1871.

Wallace, who unfortunately never wrote a book on the subject, probed deeper into the nature of man than any of the circle immediately around Darwin. Because in the end science has so thoroughly accepted them, we have not only forgotten their source but also forgotten how heretical some of his views were at the time they were uttered. First Wallace postulated an erect, small-brained bipedal stage of human development, followed by a second phase in which the human brain and cranium assumed its present size and form. Only with the present-day discovery of the Australopithecine man-apes is the early stage beginning to be documented. Second, he quickly saw that the complete fossil history of man might well be prolonged far beyond Pleistocene times, and that the big-brained men of the upper Pleistocene, who were at that time troubling the evolutionists, need not be regarded as an effective argument against the reality of the human transformation. Rather, the scientists must cease confusing living races with grades or levels on the evolutionary scale of the past—something which was at that time exceedingly common. Natives were often described as apelike in appearance, and there was a strong unconscious tendency to see the whole story of human evolution revealed in a sequence from such existing apes as the gorilla through the "lower" living races to Caucasian man.

It is just here that Wallace's deep humanity and long experience with primitive peoples reveal with particular clarity his more sophisticated approach to the subject. At a time when many naive observers were comparing the languages of primitives to the chattering of apes or monkeys, Wallace stated unequivocally: "Among the lowest savages with the least copious vocabularies the capacity of uttering a variety of distinct articulate sounds, and of applying to them an almost infinite amount of modulation and inflection, is not in any way inferior to that of the higher races."

Wallace believed that, however the fact had come about, all the existing races were mentally pretty much equal, having attained their *Homo sapiens* status a long time ago. Why human beings scattered over such remote distances should be so similar in intellectual capacity, while at the same time varying so vastly in their technological achievements, he did not profess to know. Of one thing, however, Wallace felt certain. Man, even savage man, possessed latent mental powers—ability to understand and produce music, mathematics, art—which were not accountable for, Wallace felt, in terms of the simple utilitarian struggle for existence as portrayed by the Darwinists.

In 1864, shortly before marrying Annie Mitten, the daughter of the leading English authority on mosses, Wallace composed a paper which led eventually to strong intellectual differences, but never a personal break, with his friend Darwin. In this paper he gave vent to a new view; namely, that with the rise of the human brain a creature

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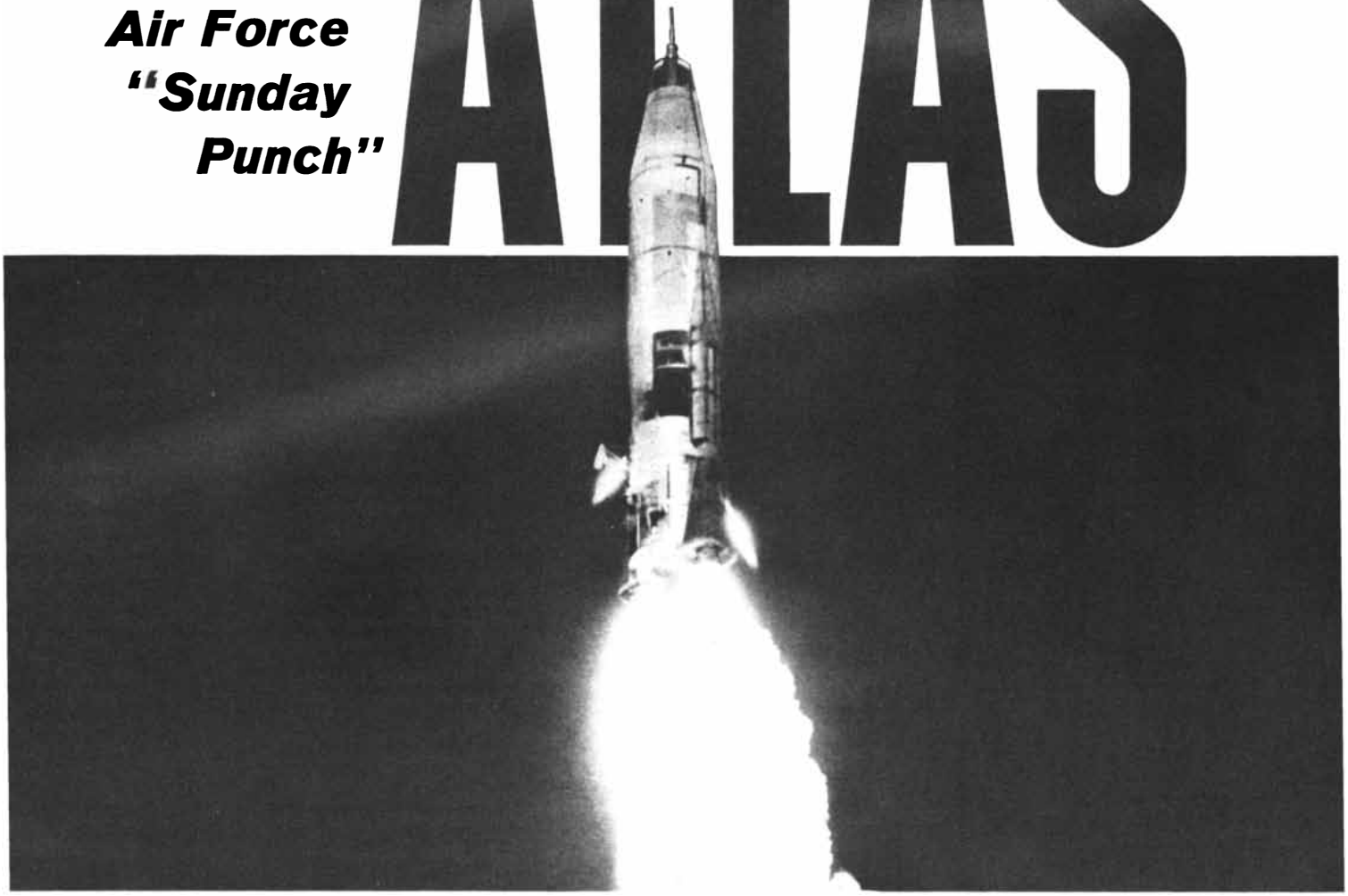

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had emerged who, for the first time in the long history of life, had escaped from the specialization of *parts* toward which evolution seemed always to progress.

With man this process was apparently at an end. Man, in his brain, had developed a specialized organ whose whole purpose was to enable him to escape specialization. He could now increasingly assign to his clothing and implements the special activities for which the animal had to develop organs in its own body. Man, by contrast, could take off and put on. Specialization could be left to his cultural shell, his technology. Armored within that shell, great-brained man was in the process of acquiring a sort of timeless, unchanging body in the midst of faunas and floras still forever evolving and vanishing.

Wallace did not deny that small alterations might still be taking place in man, but he regarded them as insignificant. "With our advent," Wallace maintained, "there had come into existence a being in whom that subtle force we term *mind* became of far more importance than mere bodily structure." We have taken away from nature the power of change which she exercises over all other animals. "Man does this by means of his intellect alone," Wallace argued, "which enables him with an unchanged body still to keep in harmony with the changing universe." Wallace, leaping beyond his colleagues, had glimpsed the full anthropological significance of the evolved brain. The idea was hailed by prominent thinkers. John Fiske spoke of it as opening up "an entirely new world of speculation."

Darwin expressed his admiration of the paper to Hooker, calling it "most striking and original." He agreed to the leading idea, and expressed the wish that Wallace had written Lyell's chapters on man. It was only later, as Wallace's bepuzzlement over man increased, that the two men came to a parting of the ways.

"Natural selection," pondered Wallace, "could only have endowed savage man with a brain a few degrees superior to that of an ape, whereas he actually possesses one very little inferior to that of a philosopher." Man's curious hairlessness, the structure of the human larynx, and other odd human features began to loom impressively in Wallace's thinking. Finally the man who had not been impressed in his youth by organized religion was led to suggest that a higher intelligence might have played a hand in the development of our kind.

"I differ grievously from you, and am very sorry for it," wrote Darwin courteously.

Huxley was severely critical.

Hooker wrote to Darwin of Huxley's remarks: "The tumbling over of Wallace is a . . . service to science."

This was curious emotionalism. It is written about the man who aided Darwin to recognize the full sweep and significance of variation and to strengthen the account of it in the later editions of the *Origin*. It is spoken about the worker whose two-volume work, *The Geographical Distribution of Animals,* is a biological classic. It is said of the man for whom Wallace's Line, dividing the faunal region of continental Asia from that of New Guinea and Australia, is named. It is said of one who did much to destroy narrow Victorian racial prejudices, and whose contributions on a variety of subjects have been appropriated and passed down to our day without acknowledgement.

It is comparatively easy to give a fair account of a man who dies within his generation. He is encapsulated in his own time, and his follies and achievements can be comprehended accordingly. It is not so simple to evaluate the career of Alfred Russel Wallace. He was born in one age and survived to die in another. As a young man he had surveyed for the first railroad lines in England. He had been shipwrecked in the days of sail. Yet it was his fate to live on into the first days of the airplane and the automobile.

His was a full life—that much can be said. A lengthy biographical study would have to incorporate much that cannot be included here: his growing interest in spiritualism, his odd antipathy to vaccination, his lifelong defense of the poor and helpless, his bitter memories of the worst of the Industrial Revolution. Many of his ideas were mistaken. Some forecast the future with uncanny perception. Some, as we have seen, outran with a flashing brilliance even his friend and colleague, Darwin.

Wallace never compromised his beliefs even when they caused contemptuous comment among his associates. He was an individualist of a sort rarely seen in the "team science" of the modern era. In the celebrations of the Darwinian Centennial he will be mentioned only perfunctorily; he belongs to another day.

"If you would learn the secrets of nature," Henry David Thoreau once remarked, "you must practise more humanity than others." It is the voice of a contemporary in the years before the green continents were despoiled. Wallace would have understood the words.

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