GEORGE BETTANY

LIFE OF CHARLES DARWIN

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Содержание

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NOTE

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DARWIN revealed himself so largely in his books, that a vivid picture of much of his life can be extracted from them. Thus it has been found possible to combine much biographical interest with sketches of his most important works. Like other biographers of Darwin, I am much indebted to Mr. Woodall's valuable memoir, contributed to the Transactions of the Shropshire Archæological Society. But original authorities have been consulted throughout, and the first editions of Darwin's books quoted, unless the contrary is explicitly stated. I am greatly obliged to Messrs. F. Darwin and G. J. Romanes for kindly permitting me to quote from Mr. Darwin's letters to Mr. Romanes. I must also express my thanks to my friends, Mr. Romanes and Prof. D'Arcy W. Thompson, for doing me the great service of looking over the proof-sheets of this book.

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CHAPTER I

IF ever a man's ancestors transmitted to him ability to succeed in a particular field, Charles Darwin's did. If ever early surroundings were calculated to call out inherited ability, Charles Darwin's were. If ever a man grew up when a ferment of thought was disturbing old convictions in the domain of knowledge for which he was adapted, Charles Darwin did. If ever a man was fitted by worldly position to undertake unbiassed and long-continued investigations, Charles Darwin was such a man. And he indisputably found realms waiting for a conqueror. Yet Darwin's achievements far transcend his advantages of ancestry, surroundings, previous suggestion, position. He stands magnificently conspicuous as a genius of rare simplicity of soul, of unwearied patience of observation, of striking fertility and ingenuity of method, of unflinching devotion to and belief in the efficacy of truth. He revolutionised not merely half-a-dozen sciences, but the whole current of thinking men's mental life.

The Darwins were originally a Lincolnshire family of some position, and being royalists suffered heavy losses under the Commonwealth. The third William Darwin (born 1655), whose mother was a daughter of Erasmus Earle, serjeant-at-law,[1]

[1] This is the Erasmus Earle who forms the subject of "A Lawyer's Love Letters," in *The National Review*, February, 1887. Letters of his are also printed in the Tenth Report of the Historical MSS. Commission.

married the heiress of Robert Waring, of Wilsford, Notts, who also inherited the manor of Elston, near Newark, in that county, which still remains in the family. Robert Darwin, second son of this William Darwin, succeeded to the Elston estate, and was described by Stukeley, the antiquary, as "a person of curiosity," an expression conveying high commendation. His eldest son, Robert Waring Darwin, studied botany closely, and published a "Principia Botanica," which reached a third edition; but his youngest son, Erasmus, born 1731, was destined to become the first really famous man of the family.

Erasmus Darwin's personal characteristics, his medical talents, and his poetic writings were such as to overshadow, for his own generation, his scientific merit. We have not space here to describe his career and his works, which has been so well done by his grandson, and by Ernst Krause ("Erasmus Darwin," 1879). Horace Walpole regarded his description of creation in "The Botanic Garden" (part i., canto 1, lines 103-114) as the most sublime passage in any language he knew: and *The Edinburgh Review* (vol. ii., 1803, p. 501) says of his "Temple of Nature": "If his fame be destined in anything to outlive the fluctuating fashion of the day, it is on his merit as a poet that it is likely to rest; and his reveries in science have probably no other chance of being saved from oblivion but by having been 'married to immortal verse.'"

The present age regards it as next to impossible to write science in poetry; although few have succeeded better in the attempt than Erasmus Darwin. It is singular that he should

have partially anticipated his illustrious grandson's theories, but without supporting them by experimental proof or by deep scientific knowledge. Suffice it to say now, that Erasmus contemplated to a great extent the same domain of science as Charles Darwin, having also a mechanical turn; and was educated at Edinburgh and Cambridge. His observations on Providence in 1754, when only twenty-three, in commenting on his father's death, are very interesting to compare with his grandson's attitude: "That there exists a superior Ens Entium, which formed these wonderful creatures, is a mathematical demonstration. That He influences things by a particular providence is not so evident. The probability, according to my notion, is against it, since general laws seem sufficient for that end… The light of Nature affords us not a single argument for a future state: this is the only one, that it is possible with God, since He who made us out of nothing can surely re-create us; and that He will do this we humbly hope." He published an ode against atheism, with which he has strangely enough often been charged, beginning —

> "Dull atheist, could a giddy dance
> Of atoms lawless hurl'd
> Construct so wonderful, so wise,
> So harmonised a world?"

and his moral standpoint is shown by the declaration that "the sacred maxims of the author of Christianity, 'Do as you would be done by,' and 'Love your neighbour as yourself,' include all our

duties of benevolence and morality; and if sincerely obeyed by all nations, would a thousandfold multiply the present happiness of mankind" ("Temple of Nature," 1803, p. 124). His principal poetical writings were "The Botanic Garden," in two parts; Part I. containing "The Economy of Vegetation," first published in 1790; and Part II., "The Loves of the Plants," in 1788, before the first part had appeared. "The Temple of Nature, or the Origin of Society," was published after his death, in 1803. His chief prose works are "Zoonomia, or the Laws of Organic Life," in two volumes, 1794-6, the second volume being exclusively medical; and "Phytologia, or the Philosophy of Agriculture and Gardening," 1800. All these books are in quarto, with plates. His views on species are referred to on pages 66 and 67.

Robert Waring Darwin, third son of Erasmus by his first wife, Mary Howard, was born in 1766. As a boy he was brought much into association with the Wedgwoods of Stoke, Josiah Wedgwood being one of Erasmus Darwin's most intimate friends. In 1779 Robert, already destined to be a doctor, stayed at Etruria for some time, sharing with Wedgwood's children in Warltire's private chemical instruction; and Josiah Wedgwood wrote at this time: "The boys drink in knowledge like water, with great avidity." Before he was twenty Robert Darwin had taken his medical degree with distinction at Edinburgh, where he had the advantage of the lectures of Black, Cullen, and Gregory, and had also studied at Leyden, and travelled in Germany. In 1786 his father set him up in practice at Shrewsbury, leaving

him with twenty pounds, which was afterwards supplemented by a similar sum from his uncle, John Darwin, Rector of Elston. On this slender capital he contrived to establish himself, in spite of severe competition; and his burly form and countenance, as he sat in his invariable yellow chaise, became well known to every man, woman, and child around Shrewsbury for many miles. Before long, no one thought of sending to Birmingham for a consultant, and Dr. Darwin was for many years the leading Shropshire physician, and accumulated an abundant fortune.

According to his son Charles, Robert Darwin "did not inherit any aptitude for poetry or mechanics, nor did he possess, as I think, a scientific mind. He published, in vol. lxxvi. of the 'Philosophical Transactions,' a paper on Ocular Spectra, which Wheatstone told me was a remarkable production for the period; but I believe that he was largely aided in writing it by his father. He was elected a Fellow of the Royal Society in 1788. I cannot tell why my father's mind did not appear to me fitted for advancing science, for he was fond of theorising, and was incomparably the most acute observer whom I ever knew. But his powers in this direction were exercised almost wholly in the practice of medicine and in the observation of human character. He intuitively recognised the disposition or character, and even read the thoughts, of those with whom he came into contact, with extraordinary astuteness. This skill partly accounts for his great success as a physician, for it impressed his patients with belief in him; and my father used to say that the art of gaining confidence

was the chief element in a doctor's worldly success."

Sensitive, sociable, a good talker, high-spirited and somewhat irascible, a man who admitted no one to his friendship whom he could not thoroughly respect, the friend of the poor, prescribing gratuitously to all who were needy, pre-eminent for sympathy, which for a time made him hate his profession for the constant suffering it brought before his eyes – such was Charles Darwin's father. Miss Meteyard, in her "Group of Englishmen," 1871, gives a vivid picture of the old doctor, his acknowledged supremacy in Shrewsbury, his untiring activity and ubiquity, his great dinner parties, his liberal and rather unpopular opinions, tolerated for the sake of his success in curing his patients. His face, powerful, unimpassioned, mild, and thoughtful, was always the same as he rolled through the streets and lanes, for he sat "as though carved in stone." His love of children was marked. "He would address them in his small, high-pitched falsetto voice, and if their answers pleased him he would reply; and occasionally, lifting them on to a chair or table, he would measure their heads with his broad hand, as though reading character, and mentally prognosticating their future fate."

The successful doctor bought a piece of land near the Holyhead road, and built on it a large square house, of plain architecture, which from its charming position, a hundred feet above the Severn, received the name of "The Mount."[2] Having

[2] "The house is seen," says Mr. Woodall, "from the line immediately beyond the low tower of St. George's Church. Visitors who make a pilgrimage there, after crossing

thus provided the nest, in 1796 he brought home his wife, Susannah Wedgwood, eldest daughter of the celebrated potter, to whom he was married at Marylebone Church on April 18th.

The character and education of Charles Darwin's mother is a matter of considerable interest, notwithstanding that her death when he was only eight years old cut short her opportunities of influencing him. She was born at Burslem in January, 1765, and a year after her father describes her as a "fine, sprightly lass:" she became his best-beloved child. She was partly educated in London, under the eye of her father's partner, the accomplished Thomas Bentley, in whose heart she won as tender a place as in her father's. Later she continued her education at home with her brothers, under good tuition. Many visits were exchanged between the Darwins and the Wedgwoods, and old Erasmus Darwin became very fond of Miss Wedgwood. By the time of her marriage she was matured by much intercourse with notable people, as well as by extensive reading, and from her

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the Welsh Bridge, follow the main street until St. George's Church is passed, and the continuous line of houses ceases. The next carriage drive, on the right, cutting in two a lofty side-walk, is the entrance to The Mount. A short street of new houses, near St. George's Church, has been called 'Darwin Street;' as yet the only public recognition in the town of the greatest of Salopians. A memorial of a more private character has been placed in the Unitarian Chapel, in the form of a tablet bearing the following inscription: – 'To the memory of Charles Robert Darwin, author of "The Origin of Species," born in Shrewsbury, February 12th, 1809. In early life a member and constant worshipper in this church. Died April 19th, 1882.' Mrs. Darwin, we believe, was not strict in her adhesion to the communion in which she had been brought up, but often attended St. Chad's Church, where Charles and his brother were baptized."

experience of London society and varied travel in England was well fitted to shine as the county doctor's wife. From her father, who died in 1795, she had doubtless inherited, in addition to a handsome fortune, many valuable faculties, and probably she transmitted more of them to her son Charles than she herself manifested. Josiah Wedgwood, over whose career it would be delightful to linger, is well described by Miss Meteyard in words which might be precisely applied to Charles Darwin, as "patient, stedfast, humble, simple, unconscious of half his own greatness, and yet by this very simplicity, patience, and stedfastness displaying the high quality of his moral and intellectual characteristics, even whilst insuring that each step was in the right direction, and firmly planted." A truly experimental genius in artistic manufacture, Wedgwood foreshadowed a far greater experimental genius in science.

Before her famous son was born, however, Mrs. Darwin's health had begun to fail, and in 1807 she wrote to a friend: "Every one seems young but me." Her second son (four daughters having preceded him) was born at The Mount on February 12, 1809, and christened "Charles Robert," at St. Chad's Church, Shrewsbury, on November 17th following. No doubt her declining health emphasised her attachment to home pursuits, to quiet reading, to the luxuriant garden, and to her numerous domestic pets. The beauty, variety, and lameness of The Mount pigeons was well known in the town and far beyond. Mr. Woodall states that one of Darwin's schoolfellows, the Rev. W. A. Leighton, remembers

him plucking a plant and recalling one of his mother's elementary lessons in botany. Too soon however the mother was taken from The Mount; she died in July, 1817, when Charles was between eight and nine years old.

The eldest son of Dr. Robert Darwin, on whom the grandfather's name of Erasmus had been bestowed, is notable as the intimate friend of the Carlyles. "He had something of original and sarcastically ingenious in him," says Carlyle, in his "Reminiscences," "one of the sincerest, naturally truest, and most modest of men… E. Darwin it was who named the late Whewell, seeing him sit, all ear (not all assent), at some of my lectures, 'The Harmonious Blacksmith.' My dear one had a great favour for this honest Darwin always; many a road to shops, and the like, he drove her in his cab, in those early days when even the charge of omnibuses was a consideration, and his sparse utterances, sardonic often, were a great amusement to her. 'A perfect gentleman,' she at once discerned him to be, and of sound worth and kindliness, in the most unaffected form." He died in 1881, aged 77, leaving no memorial to the public of his undoubtedly great abilities. Like his younger brother, he was a member of Christ's College, Cambridge, where he graduated M.B., in 1828.

Early in 1817, the closing year of his mother's life, Charles Darwin was placed at school with the Rev. George Case, minister of the Shrewsbury Unitarian church, to which the Darwins were attached, in this resembling the Wedgwoods. At midsummer,

1818, however, the boy entered Shrewsbury Grammar School, then under Samuel Butler, afterwards Bishop of Lichfield. Classics, as ever, formed the staple of the instruction there afforded, and proved but little to the future naturalist's taste. Unfortunately for the repute of English schools, Charles Darwin was little benefited by his schooling; and Euclid, then an extra subject, constituted, to his mind, the only bit of real education Shrewsbury school gave him. Seventy years later, the study of mother earth and her teeming productions, which Darwin made so attractive, is still but scantily represented in the instruction afforded by our great schools.

Thus out of sympathy with the prevalent studies, the youth showed no fondness for his schoolfellows' sports. He was reserved, frequently lost in thought, and fond of long solitary rambles, according to one schoolfellow, the Rev. W. A. Leighton; another, the Rev. John Yardley, Vicar of St. Chad's, Shrewsbury, remembers him as cheerful, good-tempered, and communicative. One of the recorded incidents of his boyish days is a fall from the old Shrewsbury wall, while walking in a "brown study." Even at this early period he was fond of collecting objects which many schoolboys delight in, such as shells and minerals, seals, franks, and coins; and the mechanical aptitude derived from both the Darwins and the Wedgwoods was manifested by keen interest in mechanism. One especially remembered youthful treat was when his uncle Josiah Wedgwood explained to him the principle of the vernier. No doubt the

pigeons, the exotics, the shrubs and flowers of his father's grounds impressed themselves indelibly on the boy's mind and unconsciously prepared him for his future. Schooldays were for him fortunately not protracted, for in 1825, at the age of sixteen, he went to Edinburgh University, where his father and grandfather had likewise studied, with the idea of devoting himself to medicine. The youth of sixteen was well equipped with the results of long thinking and observing rather than with book-learning, and was prepared to play an independent part without noise and show, assimilating that which commended itself to his mind, and rejecting that which found no appropriate soil in him, in a manner characteristic of genuine originality.

CHAPTER II

WHEN Charles Darwin went to Edinburgh, the university was not in one of its palmiest periods. The medical professors failed to attract him to their profession, and two years of Edinburgh satisfied him that medicine should not absorb him. With natural history the case was different. Its attractiveness for Darwin increased. He found congenial companionship in the Edinburgh Plinian Society, and Mr. W. F. Ainsworth relates (in *The Athenæum*, May 13, 1882) that Darwin and himself made frequent excursions on the shores of the Firth of Forth in pursuit of objects of natural history, sometimes visiting the coasts of Fifeshire, and sometimes the islands off the coast. On one occasion, accompanied by Dr. Greville, the botanist, they went to the Isle of May, and were both exceedingly amused at the effect produced upon the eminent author of the Scottish Cryptogamic Flora by the screeching of the kittiwakes and other water-fowl. He had actually to lie down on the greensward to enjoy his prolonged cachinnation. On another occasion the young naturalists were benighted on Inch Keith, but found refuge in the lighthouse.

Darwin was now not merely a collector and exploring naturalist, but he observed biological facts of importance. On the 27th of March, 1827, he made a communication to the Plinian Society on the ova, or rather larvæ, of the Flustra or

sea-mat, a member of the class Polyzoa, forming a continuous mat-like colony of thousands of organisms leading a joint-stock existence. He announced that he had discovered in these larvæ organs of locomotion, then so seldom, now so frequently, known to exist on such bodies. At the same time, he made known that the small black body which until that time had been mistaken for the young state of a species of seaweed, was in reality the egg of *Pontobdella muricata*, a sort of sea-leech. On the 3rd of April following, the discoverer exhibited specimens of the latter creature with eggs and young.

In making these researches, Darwin was no doubt stimulated and aided by the teaching of Dr. Grant, afterwards Professor of Natural History at University College, London, who was then at Edinburgh, making discoveries in the structure of sponges. Professor Jameson, too, who was then forming his splendid museum of natural history, cannot fail to have influenced Darwin somewhat; and we find that the first lecture of the concluding portion of Jameson's zoological course, dealing with "The Philosophy of Zoology," had the suggestive title of "The Origin of the Species of Animals." Thus we must acknowledge that already at Edinburgh Darwin was fairly started in the paths of zoological inquiry, and the northern university must be admitted to share with Cambridge, the distinction of being the foster-parent of this giant-child.

Medicine being distasteful, Edinburgh had no other distinctive charms to offer to young Darwin, and he was entered at Christ's

College, Cambridge, early in 1828, with the idea of his becoming a clergyman of the Church of England. It might have been thought that there was scant stimulus for a biological student in the Cambridge of that period; but although the old literary and mathematical studies were still the only paths to a degree, there were men of original force and genius at work preparing the ground for a coming revolution. Sedgwick was teaching geology with the fire of a prophet, and Henslow as a botanist was showing that lessons of enthralling interest were to be learned from the humblest flower. Henslow especially attracted young Darwin, who never forgot his old teacher. In the preface to the journal of his voyage in the *Beagle* he returns his most sincere thanks to Professor Henslow, "who," he says, "when I was an undergraduate at Cambridge, was one chief means of giving me a taste for natural history; who, during my absence, took charge of the collections I sent home, and by his correspondence directed my endeavours – and who, since my return, has constantly rendered me every assistance which the kindest friend could offer."

No better idea of Darwin's Cambridge days can be given than that which is derived from reading his account of Professor Henslow, contributed to the Rev. L. Jenyns's "Memoirs" of that accomplished man. There can be no doubt, also, that in thus pourtraying the character of another, he was at the same time, as Mr. Romanes puts it, "unconsciously giving a most accurate description of his own."

"I went to Cambridge," wrote Darwin, "early in the year 1828, and soon became acquainted, through some of my brother entomologists,[3] with Professor Henslow, for all who cared for any branch of natural history were equally encouraged by him. Nothing could be more simple, cordial, and unpretending than the encouragement which he afforded to all young naturalists. I soon became intimate with him, for he had a remarkable power of making the young feel completely at ease with him; though we were all awe-struck with the amount of his knowledge. Before I saw him I heard one young man sum up his attainments by simply saying that he knew everything. When I reflect how immediately we felt at perfect ease with a man older and in every way so immensely our superior, I think it was as much owing to the transparent sincerity of his character, as to his kindness of heart, and, perhaps, even still more to a highly remarkable absence in him of all self-consciousness. One perceived at once that he never

[3] This statement by Darwin disposes of Mr. Grant Allen's assertion that geology was Darwin's "first love" (p. 36). He reckoned himself an entomologist when he went to Cambridge, and certainly Mr. Ainsworth's statement shows that he was a naturalist in a wide sense while at Edinburgh. C. V. Riley, the well-known American entomologist, says (Proceedings of the Biological Society of Washington, U.S., vol. i., 1882, p. 70) "I have the authority of my late associate editor of *The American Entomologist*, Benjamin Dann Walsh, who was a class-mate of Darwin's at Cambridge, that the latter's love of natural history was chiefly manifested, while there, in a fine collection of insects." Indeed, he was one of the original members of the Entomological Society of London, founded in 1833, and showed an active interest in its affairs throughout life, being elected a member of its council in 1838. As early as January 4, 1836, a memoir based on insects sent home by Darwin from Chiloe, was read before the Society by Charles Babington, now Professor of Botany at Cambridge.

thought of his own varied knowledge or clear intellect, but solely on the subject in hand. Another charm, which must have struck every one, was that his manner to old and distinguished persons and to the youngest student was exactly the same: to all he showed the most winning courtesy. He would receive with interest the most trifling observation in any branch of natural history, and however absurd a blunder one might make, he pointed it out so clearly and kindly, that one left him in no way disheartened, but only determined to be more accurate the next time. In short, no man could be better formed to win the entire confidence of the young, and to encourage them in their pursuits.

"His lectures on botany were universally popular, and as clear as daylight. So popular were they, that several of the older members of the university attended successive courses. Once every week he kept open house in the evening, and all who cared for natural history attended these parties, which, by thus favouring intercommunication, did the same good in Cambridge, in a very pleasant manner, as the scientific societies do in London. At these parties many of the most distinguished members of the university occasionally attended; and when only a few were present, I have listened to the great men of those days conversing on all sorts of subjects, with the most varied and brilliant powers. This was no small advantage to some of the younger men, as it stimulated their mental activity and ambition. Two or three times in each session he took excursions with his botanical class, either a long walk to the habitat of some rare

plant, or in a barge down the river to the fens, or in coaches to some more distant place, as to Gamlingay, to see the wild lily-of-the-valley, and to catch on the heath the rare natter-jack. These excursions have left a delightful impression on my mind. He was, on such occasions, in as good spirits as a boy, and laughed as heartily as a boy at the misadventures of those who chased the splendid swallow-tail butterflies across the broken and treacherous fens. He used to pause every now and then and lecture on some plant or other object; and something he could tell us on every insect, shell, or fossil collected, for he had attended to every branch of natural history. After our day's work we used to dine at some inn or house, and most jovial we then were. I believe all who joined these excursions will agree with me that they have left an enduring impression of delight on our minds.

"As time passed on at Cambridge I became very intimate with Professor Henslow, and his kindness was unbounded; he continually asked me to his house, and allowed me to accompany him in his walks. He talked on all subjects, including his deep sense of religion, and was entirely open. I owe more than I can express to this excellent man. His kindness was steady. When Captain Fitzroy offered to give up part of his own cabin to any naturalist who would join the expedition in H.M.S. *Beagle*, Professor Henslow recommended me as one who knew very little, but who, he thought, would work. I was strongly attached to natural history, and this attachment I owed in large part to him. During the five years' voyage he regularly corresponded with me,

and guided my efforts; he received, opened, and took care of all the specimens sent home in many large boxes; but I firmly believe that, during these five years, it never once crossed his mind that he was acting towards me with unusual and generous kindness.

"During the years when I associated so much with Professor Henslow I never once saw his temper even ruffled. He never took an ill-natured view of any one's character, though very far from blind to the foibles of others. It always struck me that his mind could not be even touched by any paltry feeling of vanity, envy, or jealousy. With all this equability of temper and remarkable benevolence, there was no insipidity of character. A man must have been blind not to have perceived that beneath this placid exterior there was a vigorous and determined will. When principle came into play no power on earth could have turned him one hair's breadth…

"In intellect, as far as I could judge, accurate powers of observation, sound sense, and cautious judgment seemed predominant. Nothing seemed to give him so much enjoyment as drawing conclusions from minute observations. But his admirable memoir on the geology of Anglesea shows his capacity for extended observations and broad views. Reflecting over his character with gratitude and reverence, his moral attributes rise, as they should do in the highest character, in pre-eminence over his intellect."

The young man's modesty is conspicuous in the above narrative. He does not see how his own transparent candour, his

desire to learn, his respect for those who were already masters of science, won upon the great men with whom he came in contact. It was by no means as "one who knew very little" that Henslow recommended Darwin to Captain Fitzroy, but as "a young man of promising ability, extremely fond of geology, and indeed all branches of natural history." "In consequence," says Fitzroy, "an offer was made to Mr. Darwin to be my guest on board, which he accepted conditionally. Permission was obtained for his embarkation, and an order given by the Admiralty that he should be borne on the ship's books for provisions. The conditions asked by Mr. Darwin were, that he should be at liberty to leave the *Beagle* and retire from the expedition when he thought proper, and that he should pay a fair share of the expenses of my table."

Darwin had taken an ordinary or "poll" degree in 1831 and was admitted a Master of Arts in 1837. In the interval he had become truly a Master of Science, which at that time was adequately recognised by no university in the British dominions. The memorable voyage of the *Beagle*, a little barque of 242 tons, was at first delayed by heavy gales which twice drove her back; but she finally sailed from Devonport on December 27, 1831. The object of the expedition was to complete the survey of Patagonia and Tierra del Fuego, to survey the shores of Chili, Peru, and some Pacific Islands, and to carry a chain of chronometrical measurements round the world.

Professor Henslow's interest in his young pupil's progress is shown by the fact that in 1835 (December 1) he printed some

extracts from his letters, for distribution among the members of the Cambridge Philosophical Society, in consequence of the notice excited by some geological observations they contained, which had been read before the society on the 16th of November previous. The following points having a personal reference to the traveller may be quoted. On August 15, 1832, Darwin wrote from Monte Video, "I might collect a far greater number of specimens of invertebrate animals if I took up less time over each: but I have come to the conclusion that two animals with their original colour and shape noted down will be more valuable to naturalists than six with only dates and place." Here we see the accuracy which was the source of much of his after-success. On November 24, 1832, he writes from the same place, "As for one little toad, I hope it may be new, that it may be christened 'Diabolicus.' Milton must allude to this very individual, when he talks of 'squat like a toad.'" In March, 1834, writing from East Falkland Island, he says, "The whole of the east coast of the southern part of South America has been elevated from the ocean since a period during which mussels have not lost their blue colour." Describing his examination of the central peaks of the Andes in Chili, he says, April 18, 1835, "I cannot tell you how much I enjoyed some of these views; it is worth coming from England, once to feel such intense delight. At an elevation of from ten to twelve thousand feet, there is a transparency in the air, and a confusion of distances, and a sort of stillness, which give the sensation of being in another world."

Coming now to Darwin's Journal as first published in 1839, forming the third volume of Fitzroy's narrative, the 7th of January, 1832, on which the Peak of Teneriffe was seen suddenly illumined, while the lower parts were veiled in fleecy clouds, is noted as "the first of many delightful days never to be forgotten." On the 16th the Cape de Verde Islands were reached, and their volcanic geology was carefully explored. Darwin was already equipped with the first volume of Lyell's famous "Principles of Geology," published in 1830, the second following in 1832; and in the second edition of his journal, published in 1845, he acknowledges with grateful pleasure "that the chief part of whatever scientific merit this journal and the other works of the author may possess, has been derived from studying the well-known and admirable 'Principles of Geology.'" He was already noting the diffusion of minute organisms and impalpable dust by winds,[4] and was much surprised to find in some dust collected on a vessel 300 miles from land particles of stone more than a thousandth of an inch square. After this, he remarks, one need not be surprised at the diffusion of the far lighter and smaller sporules of cryptogamous plants.

The volcanic island of St. Paul in the open Atlantic was touched at on February 16th, and it afforded the young naturalist

[4] Mr. Grant Allen ("Darwin," p. 42) states that Darwin observed sixty-seven distinct organic forms in the fine dust which fell on deck. It was Ehrenberg who determined these organisms in dust sent to him by Darwin, and four out of five of the packets of dust sent to Ehrenberg were given to Darwin by Lyell (Darwin's Journal, second edition, p. 5).

a text for destroying the pretty ideas as to stately palms and birds taking possession of newly-formed oceanic land; at any rate, here were only two species of sea birds, no plants, and the fauna was completed by a number of insects and spiders of no very exalted habits. Fernando Noronha was passed on February 20th, and at last the South American continent was reached.

On February 29th, at Bahia, Darwin describes his first day in a Brazilian forest, in a passage which is of special interest. "The day has passed delightfully. Delight itself, however, is a weak term to express the feelings of a naturalist who, for the first time, has wandered by himself in a Brazilian forest. The elegance of the grasses, the novelty of the parasitical plants, the beauty of the flowers, the glossy green of the foliage, but, above all, the general luxuriance of the vegetation, filled me with admiration. A most paradoxical mixture of sound and silence pervades the shady parts of the wood. The noise from the insects is so loud that it may be heard even in a vessel anchored several hundred yards from the shore; yet within the recesses of the forest a universal silence appears to reign. To a person fond of natural history, such a day as this brings with it a deeper pleasure than he can ever hope to experience again."

Arriving at Rio de Janeiro early in April, Darwin made several excursions into the interior during the following three months. On these expeditions it was rarely indeed that decent accommodation could be procured at the inns. "On first arriving," he says, "it was our custom to unsaddle the horses and

give them their Indian corn; then, with a low bow, to ask the senhor to do us the favour to give us something to eat. 'Anything you choose, sir,' was his usual answer. For the few first times, vainly I thanked Providence for having guided us to so good a man. The conversation proceeding, the case universally became deplorable. 'Any fish can you do us the favour of giving?' 'Oh, no, sir!' 'Any soup?' 'No, sir!' 'Any bread?' 'Oh, no, sir!' 'Any dried meat?' 'Oh, no, sir!' If we were lucky, by waiting a couple of hours, we obtained fowls, rice, and farinha. It not unfrequently happened that we were obliged to kill, with stones, the poultry for our own supper. When, thoroughly exhausted by fatigue and hunger, we timorously hinted that we should be glad of our meal, the pompous and (though true) most unsatisfactory answer was, 'It will be ready when it is ready!' If we had dared to remonstrate any further, we should have been told to proceed on our journey, as being too impertinent. The hosts are most ungracious and disagreeable in their manners; their houses and their persons are often filthily dirty; the want of the accommodation of forks, knives, and spoons is common; and I am sure no cottage or hovel in England could be found in a state so utterly destitute of every comfort."

When we add to these discomforts on land the fact that the young traveller was a constant sufferer from sea-sickness and nausea, which became chronic, it becomes more surprising that he should not have withdrawn early from his adventurous course. But his energy and resolution were equal to any drafts upon them,

and the delights of the study of nature outweighed all physical discomforts. Admiral J. Lort Stokes in a letter to *The Times*, after the death of his old friend and comrade in the *Beagle*, described how after perhaps an hour's work he would say, "Old fellow, I must take the horizontal for it." Then he would stretch himself on one side of the table, and obtain a brief relief from discomfort, after which he would resume work.

Some remarks which Darwin makes upon slavery in South America are very forcible, and also illustrate his own sympathetic nature. Here is one incident which struck him more than any story of cruelty, as showing the degradation of slavery. "I was crossing a ferry with a negro, who was uncommonly stupid. In endeavouring to make him understand, I talked loud, and made signs, in doing which I passed my hand near his face. He, I suppose, thought I was in a passion, and was going to strike him; for instantly, with a frightened look and half-shut eyes, he dropped his hands. I shall never forget my feelings of surprise, disgust, and shame, at seeing a great powerful man afraid even to ward off a blow, directed, as he thought, at his face. This man had been trained to a degradation lower than the slavery of the most helpless animal."

In one of the numerous additions to the second issue of the Journal in 1845, Darwin speaks thus eloquently from his heart: "On the 19th of August [1836], we finally left the shores of Brazil. I thank God I shall never again visit a slave-country. To this day, if I hear a distant scream, it recalls with painful vividness

my feelings when, passing a house near Pernambuco, I heard the most pitiable moans, and could not but suspect that some poor slave was being tortured, yet knew that I was as powerless as a child, even to remonstrate. I suspected that these moans were from a tortured slave, for I was told that this was the case in another instance. Near Rio de Janeiro I lived opposite to an old lady, who kept screws to crush the fingers of her female slaves. I have stayed in a house where a young household mulatto, daily and hourly, was reviled, beaten, and persecuted enough to break the spirit of the lowest animal. I have seen a little boy, six or seven years old, struck thrice with a horse-whip (before I could interfere) on his naked head, for having handed me a glass of water not quite clean; I saw his father tremble at a mere glance from his master's eye… I will not even allude to the many heart-sickening atrocities which I authentically heard of; nor would I have mentioned the above revolting details, had I not met with several people, so blinded by the constitutional gaiety of the negro, as to speak of slavery as a tolerable evil… Those who look tenderly at the slave-owner, and with a cold heart at the slave, never seem to put themselves into the position of the latter. What a cheerless prospect, with not even a hope of change! Picture to yourself the chance, ever hanging over you, of your wife and your little children – those objects which nature urges even the slave to call his own – being torn from you, and sold like beasts to the first bidder! And these deeds are done and palliated by men who profess to love their neighbours as themselves, who believe

in God, and pray that His will be done on earth!"

Such burning expressions are not yet superfluous, and it is wholesome to recall to a generation which scarcely realises the past miseries of slavery, and is too apt to rest content with what has been accomplished in diminishing the sufferings of slaves, white and black, the impression produced on a scientific man by what he saw. It is well, too, that it should be brought forcibly home to Englishmen that Darwin's heart was no less sympathetic than his intelligence was far-seeing, and that the testimony of friends of late years to his moral grandeur is corroborated by the personal records of his years of travel.

The variety and interest of the observations made during his stay at Rio, when tropical nature was still a fresh and unexplored page to the young observer, are wonderful. Cabbage palms, liana creepers, luxuriant fern leaves – roads, bridges, and soil – planarian worms, frogs which climbed perpendicular sheets of glass, the light of fireflies, brilliant butterflies, fights between spiders and wasps, the victories of ants over difficulties, the habits of monkeys, the little Brazilian boys practising knife-throwing – all these came in turn under his watchful eyes and are vividly described.

In July, 1832, Monte Video was reached, and the *Beagle* was occupied in surveying the extreme southern and eastern coasts of America, south of La Plata, during the succeeding two years. During ten weeks at Maldonado an entertaining excursion to the River Polanco was made, and many a humorous remark

appears in the Journal relating to it. “The greater number of the inhabitants [of European descent] had an indistinct idea that England, London, and North America were different names for the same place; but the better-informed well knew that London and North America were separate countries close together, and that England was a large town in London!” “Washing my face in the morning caused much speculation at the village of Las Minas; a superior tradesman closely cross-questioned me about so singular a practice.” Among these rich descendants of Europeans Darwin felt as if he were among the inhabitants of Central Africa; so low can the proud superior race descend, that the distance between it and the negro appeared small indeed. The remarkable absence of trees in the country could not fail to provoke comment; but it is on the old-fashioned basis, and the young student does not get beyond the conclusion “that herbaceous plants, instead of trees, were created to occupy that wide area, which, within a period not very remote, has been raised above the waters of the sea.” This appears in the first edition; but in 1845 these words were expunged, and the author says significantly “we must look to some other and unknown cause.”

At Maldonado within the distance of a morning’s walk no fewer than eighty species of birds were collected, most of them exceedingly beautiful. Darwin’s observations on the molothri (representatives of our cuckoos), the tyrant fly-catchers, and the carrion-feeding hawks are most attractive reading. Rio Negro,

much further south, was next visited, and the fauna of a salt lake examined. The adaptation of creatures to live in and near brine struck him as wonderful. "Well may we affirm," says he, "that every part of the world is habitable! Whether lakes of brine, or those subterranean ones, hidden beneath volcanic mountains – warm mineral springs – the wide expanse and depths of the ocean – the upper regions of the atmosphere, and even the surface of perpetual snow – all support organic beings." Here he found reason to believe that all the great plains which he was surveying had been raised above the sea level in a modern geological period.

Our naturalist started by land for Bahia Blanca and Buenos Ayres on August 11, 1833, and we have the record: "This was the first night which I had ever passed under the open sky, with the gear of the recado for my bed. There is high enjoyment in the independence of the Gaucho's life, to be able at any moment to pull up your horse, and say, 'Here we will pass the night.' The deathlike stillness of the plain, the dogs keeping watch, the gipsy group of Gauchos making their beds round the fire, have left in my mind a strongly-marked picture of this first night, which will not soon be forgotten." After an interesting *rencontre* with General Rosas, Bahia Blanca was reached, and at Punta Alta were found many of the fossil bones which Owen subsequently described, this point being a perfect catacomb, as Darwin terms it, for monsters of extinct races. The remains of nine great kinds of quadrupeds chiefly allied to the sloths were found embedded

on the beach within a space of about two hundred yards square; and these were associated with shells of molluscs of still existing species. Here was indeed a remarkable fact to germinate in the great naturalist's mind. It bore full fruit at a later date. An important theory then current, that large animals require a luxuriant vegetation, was overthrown at the same time, for there was every reason to believe that the sterility of the surrounding country was no new thing. The South American ostrich and many other animals here afforded material for important observations.

On the way to Buenos Ayres, the rugged Sierra de la Ventana, a white quartz mountain, was ascended. Buenos Ayres was reached on September 20, 1833, and no time was lost in arranging for an expedition to Santa Fé, nearly 300 miles up the Parana. On October 3, Santa Fé was entered, and near it many more remains of large extinct mammals were found. The remains of a horse, in a similar fossil condition, greatly astonished our explorer, for it seemed indeed surprising that in South America a native horse should have co-existed with giant extinct forms, and should itself have become extinct, to be succeeded in modern times by the countless herds descended from the few horses introduced by the Spanish colonists. These and other strange facts in the distribution of mammalian animals in America led Darwin to make some pregnant comments. The enormous number of large bones embedded in the estuary deposits became continually more evident, until he came to the conclusion that the whole area of the Pampas was one wide sepulchre.

Unfortunately ill-health compelled the explorer to return, and on October 12th he started for Buenos Ayres in a small vessel. During this journey he had an opportunity of examining the shifting and variable islands of the muddy Parana, on which the jaguar thrives. Arrived at Las Conchas, a revolution had broken out, and Darwin was detained to a certain extent under surveillance; but by the influence of General Rosas' name, he was allowed to pass the sentinels, leaving his guide and horses behind, and ultimately reached Buenos Ayres in safety. After a fortnight's delay, Monte Video was once more made for. Here it appeared that the *Beagle* would remain sometime longer, so the restless inquirer started on another expedition, this time up the Uruguay and Rio Negro. One of the halts was at the house of a very large landed proprietor. A friend of the proprietor's, a runaway captain from Buenos Ayres, was very anxious to have the traveller's opinion on the beauty of the Buenos Ayres ladies, and on receiving satisfactory assurances, voluntarily gave up his bed to the stranger! During this journey amazing quantities of huge thistles were met with, the cardoon being as high as a horse's back, while the Pampas thistle rose above the rider's head. To leave the road for a yard was out of the question. Incidentally the writer describes fully the horsemanship of the Gauchos, and gives a vivid picture of the state of society in the towns.

During this journey, too, a peculiar breed of small cattle, called niata, was observed, but full details were not given till the second edition of the Journal appeared. This breed is strangely at

a disadvantage in droughts, compared with ordinary cattle; their lower jaws project beyond the upper, and their lips do not join, rendering them unable to browse on twigs. "This strikes me," says Darwin, "as a good illustration of how little we are able to judge from the ordinary habits of life, on what circumstances, occurring only at long intervals, the rarity or extinction of a species may be determined." By the time this appeared, however, in 1845, the author had embarked on his great investigation.

The Rio Plata was quitted on December 6, 1833, and sail was made for Port Desire, on the coast of Patagonia. One evening, ten miles from the Bay of San Blas, myriads of butterflies filled the air, so that the seamen cried out that it was snowing butterflies. The flight seemed to be voluntary. On another occasion many beetles were found alive and swimming, seventeen miles from the nearest land. But these instances were insignificant compared with the alighting of a large grasshopper on the *Beagle*, when to windward of the Cape de Verde Islands, and when the nearest land, in a direction not opposed to the prevailing trade wind, was 370 miles distant. Marvellous appearances of spiders far from land were also noted. One day when the ship was sixty miles from land vast numbers of a small gossamer spider arrived. Its habits in fact were aëronautic; it would send forth a small thread, and suddenly letting go its hold, would sail away horizontally.

The *Beagle* arrived at Port Desire on December 23, 1833, but Patagonia afforded less of interest to the zoologist than the northern countries. The next halt was made at Port St. Julian, 110

miles further south, on January 9, 1834. Here the evidences of the modern elevation of Patagonia were powerfully reinforced, and further, from the nature of the animal remains arose the conviction that "existing animals have a close relation in form with extinct species," another of the germinal facts which bore fruit in the "Origin of Species." Darwin was led to speculate on the causes which could have extinguished so many great species, and he remarks most suggestively: "One is tempted to believe in such simple relations as variation of climate and food, or introduction of enemies, or the increased numbers of other species, as the cause of the succession of races." But he does not yet go farther. He ends his reflections by observing: "All that at present can be said with certainty is that, as with the individual, so with the species, the hour of life has run its course, and is spent."

In the second edition of the Journal the philosopher showed signs of considerable advance (pp. 174-5). The effect of changed conditions is further developed. The checks to indefinite multiplication are insisted on, while the tendency of every species to increase geometrically is clearly pointed out. In the place of the former concluding sentence we find the following: "To admit that species generally become rare before they become extinct – to feel no surprise at the comparative rarity of one species with another, and yet to call in some extraordinary agent and to marvel greatly when a species ceases to exist, appears to me much the same as to admit that sickness in the individual is the prelude to

death – to feel no surprise at sickness – but when the sick man dies, to wonder, and to believe that he died through violence."

The continental regions of South America did not supply the sole food for the reflections of the young naturalist during this period. An intervening visit had been paid, in December, 1832, and January, 1833, to Tierra del Fuego, and the natives were most carefully observed. He was greatly struck by their low condition; "one can hardly make oneself believe they are fellow creatures, and inhabitants of the same world." Yet these abject people have been infinitely raised since that period by missionaries, and Darwin, hearing of this success, which he termed wonderful, sent a donation to the South American Missionary Society.

The Falkland Islands were explored both in 1833 and 1834, and the Straits of Magellan were carefully examined, and many valuable geological facts recorded. The southern portion of the continent was at last quitted for Chili, Valparaiso being reached on July 23, 1834. After Tierra del Fuego this was a delightful change, and here Darwin found an old schoolfellow and friend, Mr. Richard Corfield, who entertained him hospitably during his stay in Chili. Various expeditions to the Andes, to Santiago, to gold mines and copper mines, supplied abundant objects of curiosity and science, as well as varied visions of beauty; but the fatigues undergone had to be paid for by a month's illness at Valparaiso, during which Mr. Corfield's kindness was unremitting.

The large island of Chiloe was visited in November, and its climate even in summer proved wretched, reminding one of some parts of the Hebrides, a week without torrents of rain being wonderful. Castro, the almost deserted Spanish capital, could not furnish, even among hundreds of inhabitants, a pound of sugar or an ordinary knife. No one possessed either a watch or a clock, and the church bell was rung by guess by an old man who was supposed to have the best notion of time.

In December the rugged Chonos Archipelago, still further south, was explored. Here a storm worthy of Tierra del Fuego was experienced. "White, massive clouds were piled up against a dark blue sky, and across them black, ragged sheets of vapour were rapidly driven. The successive mountain ranges appeared like dim shadows; and the setting sun cast on the woodland a yellow gleam, much like that produced by the flame of spirits of wine on a man's countenance. The water was white with the flying spray; and the wind lulled and roared again through the rigging. It was a most ominous, sublime scene." While near Tres Montes the year 1835 was ushered in, as Darwin says, "with the ceremonies proper to it in these regions. She lays out no false hopes; a heavy N.W. gale, with steady rain, bespeaks the rising year. Thank God, we are not destined here to see the end of it, but hope then to be in the Pacific, where a blue sky tells one there is a heaven – a something beyond the sky above our heads."

Valdivia being reached in February, the *Beagle* party were witnesses of a severe earthquake. Darwin was on shore, lying

down in the wood to rest. The effect produced upon him by the motion he experienced was very marked: “There was no difficulty in standing upright, but the motion made me almost giddy. It was something like the movement of a vessel in a little cross ripple, or still more like that felt by a person skating over thin ice, which bends under the weight of his body. A bad earthquake at once destroys the oldest associations; the world, the very emblem of all that is solid, has moved beneath our feet like a crust over a fluid; one second of time has conveyed to the mind a strange idea of insecurity, which hours of reflection would never have created.” By the same earthquake every house in Concepcion (afterwards visited) was thrown down, and a most impressive sight met the travellers.

Arriving at Valparaiso again on March 11, 1835, after only an interval of two days the indefatigable explorer started to cross the Cordillera by the seldom traversed Portillo pass. Here geological observations were abundant. The roar of the mountain torrents spoke eloquently to the geologist. “The thousands and thousands of stones, which, striking against each other, make the one dull uniform sound, are all hurrying in one direction. It is like thinking of time, when the minute that now glides past is irrecoverable. So it is with these stones; the ocean is their eternity, and each note of that wild music tells of one other step towards their destiny.” Who can fail to discern in such a passage the poetic instinct which Erasmus Darwin more fully manifested?

Mendoza was reached on March 27th, and on the 29th the return journey by the northern or Uspallata pass was commenced. On the 10th of April Santiago was again arrived at, and Mr. Caldcleugh most hospitably welcomed the traveller, delighted with his expedition. "Never," he says, "did I more deeply enjoy an equal space of time." Various excursions in Northern Chili and Peru followed. Little was seen of Peru, owing to the troubled state of public affairs, and there was very little regret when the *Beagle* started early in September on her journey across the Pacific.

The Galapagos Islands, with their two thousand volcanic craters, their apparently leafless bushes and wretched weeds, their peculiar animals, so unsuspicious of man that they did not move when stones were thrown, were extremely interesting to the naturalist, and gave rise to numerous observations and suggestions in later works. The huge tortoises slowly carrying their great bodies about, appeared like strange antediluvian animals. The hideous large water-lizard (*Amblyrhynchus*), swimming with perfect ease, and capable of an hour's immersion in sea-water; and the land lizard of the same genus, so numerous that at James Island it was hardly possible to find a spot free from their burrows, the roofs of which constantly give way under the pedestrian, were equally strange denizens of this group of islands, where reptiles replace herbivorous mammals. With regard to the last-mentioned species we find a remark indicating the persistence of a belief in special creation up to this date. "It

would appear as if this species had been created in the centre of the Archipelago, and thence had been dispersed only to a certain distance."

During the years intervening between the first and second editions of the Journal, reflection intensified Darwin's perception of the singularity of the Galapagos fauna. "Considering the small size of these islands," he says, "we feel the more astonished at the number of their aboriginal beings, and at their confined range. Seeing every height crowned with its crater, and the boundaries of most of the lava streams still distinct, we are led to believe that within a period geologically recent the unbroken sea was here spread out. Hence, both in space and time, we seem to be brought somewhat nearer to that great fact – that mystery of mysteries – the first appearance of new beings on this earth." And he afterwards says, "One is astonished at the amount of creative force, if such an expression may be used, displayed on these small, barren, and rocky islands; and still more so at its diverse yet analogous action in points so near each other."

The long voyage to Tahiti, 3,200 miles, begun on October 20, 1835, ending on November 15th, was succeeded by a most enjoyable stay. Darwin was as delighted as any traveller with the charms of the island and the islanders. His testimony to the quality of English products is worth noticing, if only as a piece of natural patriotism. He acknowledges that Tahitian pineapples are of excellent flavour, perhaps better than those cultivated in England, and this he believes to be the highest compliment which

can be paid to a fruit, or indeed to anything else. He found reason to speak well of the influence of the Christian missionaries on the natives, and of the conscientiousness of the latter, in opposition to Kotzebue's narrative.

On December 19th New Zealand was sighted. Our traveller's observations here are of much value, as relating to a late period before civilised government was effectively established. At Waimate he was delighted with the effects produced by the religious teacher. "The lesson of the missionary is the enchanter's wand," and he rejoiced as an Englishman at what his countrymen had effected. The remarkable absence of land mammals, the late enormous increase of the imported Norway rat, the dock spreading far and wide, its seeds having been sold as tobacco seeds by a rascally Englishman, the huge Kauri pines, were all full of import to the inquiring mind; but New Zealand proved on the whole less attractive, as seen by Darwin, than most other countries he had visited. December 30th saw the *Beagle* on the way to Sydney, and Port Jackson was reached on January 12, 1836. An interesting excursion to the Blue Mountains and to Bathurst showed many aspects of colonial life, as well as the strange duckbill or platypus in its native haunts. Tasmania, with which island Darwin was greatly pleased, was visited in February. In April the Keeling Islands furnished much of the material for the future book on coral reefs, the essence of which is, however, included in the Journal. Mauritius, Cape Town, St. Helena, Ascension, Bahia, Pernambuco, Cape Verde, and the

Azores were the successive stages of the homeward journey, and on October 2, 1836, anchor was cast at Falmouth, where the naturalist, equipped for his life work, was landed.

The high opinion Captain Fitzroy formed of Darwin during this long voyage is shown by many passages in his own narrative, and by many other references. He paid him the marked compliment of naming no fewer than three important geographical localities after him, namely, Mount Darwin and Darwin Sound (Tierra del Fuego), and Port Darwin in North Australia, thus connecting his name for future generations with two lands whose inhabitants were subjects of Darwin's unceasing interest and investigation throughout life, and served in no small degree to elucidate the history and rise of mankind in Darwin's mind and for a world's instruction. Fitzroy complimented his friend markedly when himself receiving the medal of the Royal Geographical Society; and in one of his papers, speaking of him as a zealous volunteer in the cause of science, observed that his perseverance might be estimated from the fact that he never ceased to be a martyr to sea-sickness; while his interest in science and his public spirit were evident from his having presented his valuable collections to the public.

The concluding pages of the Journal are both eloquent and instructive. Everywhere there had been fascinating visions, and attractive problems remained unsolved. Was it not significant of future studies that the contrast between barbarian and civilised man should have been so impressed upon the future author of

"The Descent of Man"? He writes thus on this subject, "Of individual objects, perhaps no one is more certain to create astonishment than the first sight in his native haunt of a real barbarian, of man in his lowest and most savage state. One's mind hurries back over past centuries, and then asks, could our progenitors have been such as these? Men, whose very signs and expressions are less intelligible to us than those of the domesticated animals; men, who do not possess the instinct of those animals, nor yet appear to boast of human reason, or at least of arts consequent on that reason. I do not believe it is possible to describe or paint the difference between savage and civilised man. It is the difference between a wild and tame animal: and part of the interest in beholding a savage, is the same which would lead every one to desire to see the lion in his desert, the tiger tearing his prey in the jungle, the rhinoceros on the wide plain, or the hippopotamus wallowing in the mud of some African river."

We have dwelt thus at length upon the history of this eventful voyage, not only because it filled an important space in Darwin's life, but also because it undoubtedly gave rise to the thoughts and speculations which impelled him to devote his life to the study of problems of evolution. It has been shown to some extent, how he saw, without pre-arrangement, just those phenomena which could stimulate his mind, already fit, to its highest flights. We have seen, too, how universal was Darwin's interest in nature, and how sympathetic a heart went with his scientific insight. He

had yet to show how masterly was his patience, to work for yet twenty years, in order that he might not by premature publication of a crude theory risk defeat and throw science backward rather than forward. This long patient work was to be the triumph of his genius.

CHAPTER III

ON his return home, Darwin speedily placed himself in communication with the leaders of scientific progress, and, in consequence of the valuable results of his voyage, he soon found himself in a most advantageous position. On November 20, 1836, he was elected a Fellow of the Geological Society, and before the end of the year he had sent the manuscript of one of his early papers to Lyell, who writes to him (December 26, 1836): "I have read your paper with the greatest pleasure… What a splendid field you have to write upon." He strongly advised the young man not to accept any official scientific place, but to devote himself to his own line of work. But Darwin was overpersuaded, and became a member of the Council of the Geological Society in the following February, and secretary in February, 1838. This office he held with success for three years. Lyell referred in considerable detail to the young traveller's views in his presidential address to the Society in 1837.

Darwin's geological papers soon became numerous. In 1837 he discussed in succession the recent elevation of the coast of Chili, the deposits containing extinct mammalia in the neighbourhood of the Plata, the areas of elevation and subsidence in the Pacific and Indian Oceans, as deduced from the study of coral formations, and the formation of mould (the precursor of a work he issued more than forty years later). Papers on

the connection of certain volcanic phenomena, and on the formation of mountain chains, and other geological notes on South America, were read in 1838; the interesting Parallel Roads of Glen Roy, in Scotland, which he believed to be of marine origin, were described in 1839; the erratic (glacial) boulders of South America, in 1841; and coral reefs in 1842: a full record, one would imagine, of busy years, occupied also with secretarial work. Lyell, writing to Sir John Herschel (May 24, 1837), says: "I am very full of Darwin's new theory of coral islands, and have urged Whewell to make him read it at our next meeting. I must give up my volcanic crater theory for ever, though it costs me a pang at first." In March, 1838, Lyell describes the reception of the paper on volcanic phenomena at the Geological Society. "He opened upon De la Beche, Phillips, and others, his whole battery of the earthquakes and volcanoes of the Andes; and argued that spaces of a thousand miles long were simultaneously subject to earthquakes and volcanic eruptions, and that the elevation of the Pampas, Patagonia, &c., all depended upon a common cause." In fit acknowledgment of such services to science, he was elected a Fellow of the Royal Society on January 24, 1839.

Early in 1839 Darwin married his cousin, Emma Wedgwood, daughter of his uncle Josiah Wedgwood: a union which, though consanguineous, proved in the highest degree congenial and fortunate. In succeeding years a numerous family of sons and daughters surrounded the happy parents. After considerable delays by the Admiralty, though it had long been ready, the

Journal appeared, in 1839, as the third volume of Fitzroy's "Voyages of *The Adventure* and *Beagle*." *The Quarterly Review* (lxv. 224) said that there could be no two opinions of its merits. "We find ample materials for deep thinking; we have the vivid description that fills the mind's eye with brighter pictures than painter can present, and the charm arising from the freshness of heart which is thrown over these virgin pages of a strong intellectual man, and an acute and deep observer." Its merits, however, were somewhat slow to become known to the general public, owing to the original expensive form of publication; and it was not till 1845, when the second and enlarged edition appeared as "The Journal of Researches," that the popular ear was gained. Later, under the title, "A Naturalist's Voyage Round the World," the book has become very widely known and appreciated.

The publication of "The Zoology of the Voyage of *The Beagle*," commenced in 1838, under Darwin's superintendence, gave a fuller view of the acquisitions to natural history which had been made than had previously been possible. The Treasury, acting on the representations of the presidents of the Linnean, Zoological, and Geological Societies, as well as of the naturalist himself, in 1837 made a grant of £1000 towards the expenses of publication of these memoirs. Owen's description of the fossil mammalia, completed in 1840; G. Waterhouse's of the living mammalia, in 1839; Gould's of the birds, in 1841; L. Jenyns's of the fish, in 1842; and Thomas Bell's of the reptiles, in 1843 – all in quarto, with beautiful plates, were a solid testimony to a

splendid success. Darwin furnished an introduction to each part, and the portions of the text referring to the habits and ranges of the living animals. Three species of mastodon and the gigantic megatherium were the only extinct mammalia known from South America previous to Darwin's voyage. To these were now added the *Mylodon Darwinii*, a giant sloth; the scelidotherium, a somewhat smaller form; the great camel-like, yet odd-toed, macrauchenia; and the toxodon, as large as a hippopotamus, yet having a strange resemblance to the little rodents. All these belonged to geological deposits not far anterior to the present age. The collections of living vertebrates were less profoundly interesting, but the number of new species was large; and the habits and localities being recorded by so good an observer, gave them additional value.

The fossil mammals were given by the generous traveller to the London College of Surgeons, the mammals and birds to the Zoological Society, the reptiles to the British Museum, and the fishes to the Cambridge Philosophical Society. Nor was this all. The collections of insects, shells, and crustacea were described by many able specialists in scientific publications. The flowering plants were described by Hooker, and the non-flowering by Berkeley; and, altogether, no expedition ever yielded a more solid result to the scientific naturalist, while furnishing a delightful narrative to the general reader, and laying the foundation for generalisations of surpassing importance to all thinking minds.

It was evident to many geologists that the greatest value would

attach to the full record of the geological observations made by the gifted young secretary of the Geological Society. A year after the publication of the Journal the first portion of these observations, dealing with coral reefs, was almost ready, but the continued ill-health of the author delayed the publication till 1842. When it appeared, under the title of "The Structure and Distribution of Coral Reefs," its success was immediate and complete.

Ever since their first description by voyagers, marvel had been expressed at the strange and beautiful phenomena presented by coral islands. Coral, as being built up by the tireless labours of innumerable so-called "insects," or "worms," had become associated with romantic ideas. It really consists of the internal skeletons of coral-polyps, allied to the sea anemone. Captain Basil Hall, in his "Voyage to Loo Choo," looking with the eyes of one ignorant of zoology, had credited the building of coral reefs to all kinds of creatures which lived on and near the coral after it had been made; and his erroneous views had been amplified and developed by James Montgomery, in his "Pelican Island," into the most fantastically incorrect description that ever versifier penned. Sad to relate, his lines were often quoted, as if correct, by scientific men in pre-Darwinian times.

Nothing gives clearer evidence of the power of mind which Darwin had already attained when voyaging round the world than the originality of his views on coral reefs. The lagoon islands, or atolls, he describes as "vast rings of coral rock, often many

leagues in diameter, here and there surmounted by a low verdant island, with dazzling white shores, bathed on the outside by the foaming breakers of the ocean; and, on the inside, surrounding a calm expanse of water which, from reflection, is of a bright, but pale, green colour." Keeling atoll, outside which, at less than a mile and a half distance, no bottom was found with a line 7,200 feet in length, having been fully described, and an account given of all other known atoll systems, the peculiarities of the great barrier reef of North-east Australia, and that of New Caledonia, were recounted. Off the latter, no bottom was found, at two ships' length from the reef, with a line 900 feet long. With these were linked the smaller reefs of Tahiti and others, where considerable islands are more or less completely surrounded by them. Next, the fringing or shore reefs, at first sight only a variety of barrier reefs, were clearly distinguished from them by the absence of an interior deep-water channel, and their not growing up from an immense, but from a moderate depth of water.

The remarkable fact was pointed out by Darwin that all coral islands are within a little more than 30 degrees of the Equator, but that, at the same time, they are absent over certain larger areas within the tropical seas. There are none on the West Coast of South America, nor on the West Coast of Africa. In this portion of his work we have another significant sentence bearing on the struggle for existence. In discussing the apparently capricious distribution of coral reefs, he remarks that "the study of the terrestrial and better-known half of the world must

convince every one that no station capable of supporting life is lost – nay more, that there is a struggle for each station between the different orders of nature." He describes the large fishes and the trepangs (*holothuriæ*) preying upon the coral-polyps, and shows how complex are the conditions which determine the formation of reefs on any shore. Perhaps no part of his work is more important than that in which he collects the evidence proving how rapidly coral masses grow, and that they for the most part cannot flourish in a greater depth of water than fifteen fathoms.

Reasoning upon the facts observed by himself and others Darwin now proceeded to upset the received theory that atolls were based upon submarine volcanic craters, and to substitute for it the view that there has been a prolonged and gradual subsidence of the areas upon which the atolls are based, and a corresponding upward growth of the reef-building corals. Thus fringing-reefs in time become barrier-reefs; and barrier-reefs, when they encircle islands, are converted into atolls, or lagoon islands, as soon as the last pinnacle of land sinks beneath the surface of the ocean. The whole matter is summed up thus: "A magnificent and harmonious picture of the movements which the crust of the earth has within a late period undergone is presented to us. We see vast areas rising, with volcanic matter every now and then bursting forth through the vents or fissures with which they are traversed. We see other wide spaces slowly sinking without any volcanic outbursts; and we may feel sure

that this sinking must have been immense in amount as well as in area, thus to have buried over the broad face of the ocean every one of these mountains above which atolls now stand like monuments, marking the place of their former existence." "No more admirable example of scientific method was ever given to the world," says Professor A. Geikie, "and even if he had written nothing else, this treatise alone would have placed Darwin in the very front of investigators of nature."

After thirty-two years' interval, a second edition of "Coral Reefs" appeared, in a cheaper form, in 1874. It is rare indeed for a scientific treatise to attain at once and maintain so long a position of such undisputed authority. The eminent German naturalist, Semper, in 1863, criticised the general theory in consequence of his own careful examination of the Pelew Islands; but Darwin easily answered him by pointing to the cumulative evidence in favour of his own views. The only really important work on the subject, after Darwin's, was that of Professor J. D. Dana, the eminent American naturalist and geologist, on "Corals and Coral Islands," published in 1872. Darwin, in the preface to his second edition, candidly acknowledged that he had not previously laid sufficient weight on the mean temperature of the sea in determining the distribution of coral reefs; but this did not touch his main conception. In fact, he maintained his ground undisturbed, and at the same time admired greatly Dana's book, which was the result of personal examination of more coral formations than perhaps any one man had ever studied, and

which accepted Darwin's fundamental proposition, that lagoon islands or atolls and barrier-reefs have been formed during periods of subsidence.[5]

No such strikingly original theory is propounded in the second part of "The Geology of the *Beagle*" dealing chiefly with volcanic islands. St. Jago, in the Cape de Verde Islands; Fernando Noronha, Terceira, Tahiti, Mauritius, St. Paul's, Ascension, St. Helena, and the Galapagos are in turn more or less fully described, according to the opportunities the explorer had possessed. To some extent, as in the succeeding part, Darwin adapts his views on mountain elevation too closely to those enunciated by Elie de Beaumont. The third part of the geology of the *Beagle*, entitled "Geological Observations on South America," was not published till 1846. Even this did not exhaust the contributions to geology made from the *Beagle* voyage, for it did not include the papers on the "Connection of certain Volcanic Phenomena in South America" (1838); on the

[5] Mr. John Murray's views, derived from the experience acquired in the voyage of the *Challenger*, and published in 1880, tend to modify Darwin's conclusions to some extent. Mr. Murray says that it is now shown that many submarine mountains exist, which are usually volcanic, and which, being built upon by various forms of shell-bearing animals, could be raised to such a level that ordinary corals could build upon them. He concludes that probably all atolls are seated on submarine volcanoes, and thus it is not necessary to suppose such extensive and long-continued subsidences as Darwin suggested. This view is also in harmony with Dana's views of the great antiquity and permanence of the great ocean basin. See "The Structure and Origin of Reefs and Islands." By John Murray; Proc. Roy. Soc., Edin., x. 505-18 (abstract); also *Nature*, xxii. 351-5.

"Distribution of Erratic Boulders" (1841); on the "Fine Dust which falls on Vessels" (1845); and on the "Geology of the Falkland Islands" (1846). A second edition of the two latter parts of "The Geology of the *Beagle*" was published in one volume in 1876.

Meanwhile, after spending a few years of his early married life in London, during which he was often in ill-health, Darwin fixed his residence in 1842 at Down House, near Beckenham, Kent. The little village of Down, three or four miles from the Orpington railway station, was near enough to London for convenient access, yet greatly secluded and thoroughly rural. The traveller's roving days were over, and his infirmity of health prevented him from undertaking very fatiguing journeys. After the cessation of his active work for the Geological Society, Darwin's chief public appearance was when he spoke at the Oxford meeting of the British Association, in 1847, when, strange to say, Ruskin was secretary of the Geological Section.

At Down then, situated some 400 feet above the sea level on a plateau of chalk, interrupted by wavy hollows with beech woods on the slopes, about forty years of Darwin's life were passed. Down House, one of the square red brick mansions of the last century, to which have been since added a gable-fronted wing on one side and a more squarely-built wing and pillared portico on the other, is shut in and almost hidden from the roadway by a high wall and belt of trees. On the south side a walled garden opens into a quiet meadow, bounded by underwood, through which

is seen a delightful view of the narrow valley beyond, towards Westerham.

One of the most admirable chapters of the well-known "Manual of Scientific Enquiry," published in 1849, for the use of the navy and travellers generally, and edited by Sir John Herschel, was Darwin's, on Geology. The explorer is here taught to make the most of his opportunities upon the soundest principles. The habits which the author had himself formed are inculcated upon the observer – copious collecting, accurate recording, much thinking. Nothing is omitted. Number-labels which can be read upside down must have a stop to indicate the right way up; every specimen should be ticketed on the day of collection; diagrams of all kinds should be made, as nearly as possible, to scale. "Acquire the habit of always seeking an explanation of every geological point met with." "No one can expect to solve the many difficulties which will be encountered, and which for a long time will remain to perplex geologists; *but a ray of light will occasionally be his reward, and the reward is ample*." Truly an ample reward awaited the observer who could thus speak of the value of "a ray of light;" he certainly did, to use the concluding words of the essay, "enjoy the high satisfaction of contributing to the perfection of the history of this wonderful world."

Meanwhile Darwin had been carrying on a great research on the very peculiar order of crustacea, termed Cirripedia, better known as barnacles and acorn shells. He had originally only

intended to describe a single abnormal member of the group, from South America, but was led, for the sake of comparison, to examine the internal parts of as many as possible. The British Museum collection was freely opened to him, and as the importance of studying the anatomy of many specimens became evident, the splendid collections of Messrs. Stutchbury, Cuming, and others were placed at his disposal, and he was permitted to open and to dissect unique specimens of great value. In fact, almost every naturalist of note who had any knowledge of the subject freely aided him, and the result was a masterly series of finely illustrated volumes; two on the living Cirripedia, issued by the Ray Society in 1851 and 1854; and two on the fossil Cirripedia of Great Britain, by the Palæontographical Society, published in the same years. There is evidence in these volumes that careful observations on the growth of these creatures had been made as far back as the visit to the Galapagos Islands in 1835. In many respects these works are as masterly as any the author ever wrote. Considering the previous obscurity of the subject, the difficulties attending the research, the almost entire lack at that time of any general microscopical knowledge of tissues, and especially of those of embryos, Darwin's success is marvellous. The details are too technical for statement here, but any one with a zoological training, who studies the strange complication of the reproductive systems, and the remarkable transformations which the young undergo, as told in these volumes, will appreciate more than ever the breadth and the

solidity of the basis of patiently acquired knowledge which Charles Darwin had accumulated while his “Origin of Species” was taking shape.

Конец ознакомительного фрагмента.