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CHAPTER I
THE WORLD INTO WHICH DARWIN WAS BORN

Charles Darwin was a great man, and he accomplished a great work. The Newton of biology, he found the science of life a chaotic maze; he left it an orderly system, with a definite plan and a recognisable meaning. Great men are not accidents; great works are not accomplished in a single day. Both are the product of adequate causes. The great man springs from an ancestry competent to produce him; he is the final flower and ultimate outcome of converging hereditary forces, that culminate at last in the full production of his splendid and exceptional personality. The great work which it is his mission to perform in the world is never wholly of his own inception. It also is the last effect of antecedent conditions, the slow result of tendencies and ideas long working unseen or but little noticed beneath the surface of opinion, yet all gradually conspiring together towards the definitive revolution at whose head, in the fulness of time, the as yet unborn genius is destined to place himself. This is especially the case with those extraordinary waves of mental upheaval, one of which gave us the Italian renaissance, and another of which is actually in progress around us at the present day. They have their sources deep down in the past of human thought and human feeling, and they are themselves but the final manifestation of innumerable energies which have long been silently agitating the souls of nations in their profoundest depths.

Thus, every great man may be regarded as possessing two distinct lines of ancestry, physical and spiritual, each of which separately demands elucidation. He owes much in one way to his father and his mother, his grandfathers and his grandmothers, and his remoter progenitors, from some or all of whom he derives, in varying degrees and combinations, the personal qualities whose special interaction constitutes his greatness and his idiosyncrasy; he owes much in another way to his intellectual and moral ancestors, the thinkers and workers who have preceded him in his own department of thought or action, and have made possible in the course of ages the final development of his special revolution or his particular system. Viewed as an individual, he is what he is, with all his powers and faculties and potentialities, in virtue of the brain, the frame, the temperament, the energy he inherits directly from his actual ancestors, paternal and maternal; viewed as a factor or element in a great movement, he is what he is because the movement had succeeded in reaching such and such a point in its progress already without him, and waited only for such and such a grand and commanding personality in order to carry it yet a step further on its course of development.

No man who ever lived would more cordially have recognised these two alternative aspects of the great worker's predetermining causes than Charles Darwin. He knew well that the individual is the direct cumulative product of his physical predecessors, and that he works and is worked upon in innumerable ways by the particular environment into whose midst he is born. Let us see, then, in his own case what were these two main sets of conditioning circumstances which finally led up to the joint production of Charles Darwin, the man and the philosopher, the thinking brain and the moving energy. In other words, what was the state of the science of life at the time when he first began to observe and to speculate; and what was the ancestry which made him be born a person capable of helping it forward at a single bound over its great restricting dogmatic barrier of the fixity of species?

Let us begin, in the first place, by clearing the path beforehand of a popular misconception, so extremely general and almost universal that, unless it be got rid of at the very outset of our

sketch, much of the real scope and purport of Darwin's life and work must, of necessity, remain entirely misunderstood by the vast mass of English readers. In the public mind Darwin is, perhaps, most commonly regarded as the discoverer and founder of the evolution hypothesis. Two ideas are usually associated with his name and memory. It is believed that he was the first propounder of the theory which supposes all plant and animal forms to be the result, not of special creation, but of slow modification in pre-existent organisms. It is further and more particularly believed that he was the first propounder of the theory which supposes the descent of man to be traceable from a remote and more or less monkey-like ancestor. Now, as a matter of fact, Darwin was not the prime originator of either of these two great cardinal ideas. Though he held both as part of his organised theory of things, he was not by any means the first or the earliest thinker to hold them or to propound them publicly. Though he gained for them both a far wider and more general acceptance than they had ever before popularly received, he laid no sort of claim himself to originality or proprietorship in either theory. The grand idea which he did really originate was not the idea of 'descent with modification,' but the idea of 'natural selection,' by which agency, as he was the first to prove, definite kinds of plants and animals have been slowly evolved from simpler forms, with definite adaptations to the special circumstances by which they are surrounded. In a word, it was the peculiar glory of Charles Darwin, not to have suggested that all the variety of animal and vegetable life might have been produced by slow modifications in one or more original types, but to have shown the nature of the machinery by which such a result could be actually attained in the practical working out of natural causes. He did not invent the development theory, but he made it believable and comprehensible. He was not, as most people falsely imagine, the Moses of evolutionism, the prime mover in the biological revolution; he was the Joshua who led the world of thinkers and workers into full fruition of that promised land which earlier investigators had but dimly descried from the Pisgah-top of conjectural speculation.

How far Darwin's special idea of natural selection supplemented and rendered credible the earlier idea of descent with modification we shall see more fully when we come to treat of the inception and growth of his great epoch-making work, 'The Origin of Species;' for the present, it must suffice to point out that in the world into which he was born, the theory of evolution already existed in a more or less shadowy and undeveloped shape. And since it was his task in life to raise this theory from the rank of a mere plausible and happy guess to the rank of a highly elaborate and almost universally accepted biological system, we may pause awhile to consider on the threshold what was the actual state of natural science at the moment when the great directing and organising intelligence of Charles Darwin first appeared.

From time immemorial, in modern Christendom at least, it had been the general opinion of learned and simple alike that every species of plant or animal owed its present form and its original existence to a distinct act of special creation. This *naïf* belief, unsupported as it was by any sort of internal evidence, was supposed to rest directly upon the express authority of a few obscure statements in the Book of Genesis. The Creator, it was held, had in the beginning formed each kind after a particular pattern, had endowed it with special organs devised with supreme wisdom for subserving special functions, and had bestowed upon it the mystical power of reproducing its like in its own image to all generations. No variation of importance ever occurred within the types thus constituted; all plants and animals always retained their special forms unaltered in any way from era to era. This is the doctrine of the fixity and immutability of species, almost universal in the civilised world up to the end of the last century.

Improbable as such a crude idea now seems to any person even moderately acquainted with the extraordinary variety and variability of living forms, it nevertheless contained nothing at all likely to contradict the ordinary experience of the everyday observer in the last century. The handful of plants and animals with which he was personally acquainted consisted for the most part of a few large, highly advanced, and well-marked forms, not in the least liable to be mistaken for one

another even by the most hasty and casual spectator. A horse can immediately be discriminated by the naked eye from a donkey, and a cow from a sheep, without risk of error; nobody is likely to confuse wheat with barley, or to hesitate between classing any given fruit that is laid before him as a pear or an apple, a plum or a nectarine. Variability seldom comes under the notice of the ordinary passing spectator as it does under that of the prying and curious scientific observer; and when it comes at all, as in the case of dogs and pigeons, roses and hyacinths, it is no doubt set down carelessly on a superficial view as a mere result of human selection or of deliberate mongrel interbreeding. To the eye of the average man, all the living objects ordinarily perceived in external nature fall at once under certain fixed and recognisable kinds, as dogs and horses, elms and ashes, whose limits he is never at all inclined to confound in any way one with the other.

Linnæus, the great father of modern scientific biology, had frankly and perhaps unthinkingly accepted this current and almost universal dogma of the fixity and immutability of species. Indeed, by defining a kind as a group of plants or animals so closely resembling one another as to give rise to the belief that they might all be descended from a single ancestor or pair of ancestors, he implicitly gave the new sanction of his weighty authority to the creation hypothesis, and to the prevalent doctrine of the unchangeability of organic forms. To Linnæus, the species into which he mapped out all the plants and animals then known, appeared as the descendants each of a solitary progenitor or of a primitive couple, called into existence at the beginning of all things by the direct fiat of a designing Creator. He saw the world of organic life as composed of so many well-demarcated types, each separate, distinct, and immutable, each capable of producing its like *ad infinitum*, and each unable to vary from its central standard in any of its individuals, except perhaps within very narrow and unimportant limits.

But towards the close of the eighteenth century, side by side with the general awakening of the human intellect and the arrival of a new era of free social investigation, which culminated in a fresh order of things, there was developed a more critical and sceptical attitude in the world of science, which soon produced a notable change of front among thinking naturalists as to the origin and meaning of specific distinctions.

Buffon was the first great biological innovator who ventured, in very doubtful and tentative language, to suggest the possibility of the rise of species from one another by slow modification of ancestral forms. Essentially a popular essayist, writing in the volcanic priest-suppressed France of the *ancien régime*, during the inconsistent days of Louis XV. and Louis XVI., when it was uncertain whether novel and heterodox opinions would bring down upon their author fame and reputation or the Sorbonne and the Bastille, Buffon was careful to put his conjectural conclusions in a studiously guarded and often even ironical form. But time after time, in his great discursive work, the 'Histoire Naturelle' (published in successive volumes between 1749 and 1788), he recurs anew to the pregnant suggestion that plants and animals may not be bound by fixed and immovable limits of species, but may freely vary in every direction from a common centre, so that one kind may gradually and slowly be evolved by natural causes from the type of another. He points out that, underlying all external diversities of character and shape, fundamental likenesses of type occur in many animals, which irresistibly suggest the novel notion of common descent from a single ancestor. Thus regarded, he says, not only the ass and the horse (to take a particular passage) but even man himself, the monkeys, the quadrupeds, and all vertebrate animals, might be viewed as merely forming divergent branches of one and the same great family tree. Every such family, he believed, whether animal or vegetable, might have sprung originally from a single stock, which after many generations had here developed into a higher form, and there degenerated into a lower and less perfect type of organisation. Granting this – granting that nature could by slow variation produce one species in the course of direct descent from another unlike it (for example, the ass from the horse), then, Buffon observed, there was no further limit to be set to her powers in this respect, and we might reasonably conclude that from a single primordial being she has gradually been able

in the course of time to develop the whole continuous gamut of existing animal and vegetable life. To be sure, Buffon always saves himself from censure by an obvious afterthought – 'But no; it is certain from revelation that every species was directly created by a separate fiat.' This half-hearted and somewhat subrisive denial, however, must be taken merely as a concession to the Sorbonne and to the fashionable exegesis of his own day; and, even so, the Sorbonne was too much in the end for the philosophic thinker. He had once in his life at least to make his submission and demand pardon from the offended orthodoxy of the Paris faculty.

The wave of thought and feeling, thus apologetically and tentatively stirred on the unruffled pond of eighteenth century opinion by the startling plop of Buffon's little smooth-cut pebble, soon widened out on every side in concentric circles, and affected with its wash the entire world of biological science in every country. Before the close of the eighteenth century speculation as to the origin of species was rife in all quarters of Europe. In France itself, Geoffroy St. Hilaire, constitutionally cautious and undecided, but wide of view and free from prejudice, came slowly to the conclusion, in 1795, that all species are really derived by modification from one or more primitive types. In Germany, in the very same year, Goethe, with the keen vision of the poet and the calm eye of the philosopher uniquely combined, discerned independently as by a lightning flash the identical idea of the origin of kinds by modification of pre-existent organisms. 'We may assert without hesitation,' says that great nebulous thinker and observer, 'that all the more perfect organic natures, such as fishes, amphibians, birds and mammals, with man at their head, were formed at first on one original type, which still daily changes and modifies its form by propagation.' In England, twelve months earlier, Dr. Erasmus Darwin, Charles Darwin's grandfather (of whom more anon), published his 'Zoonomia,' a treatise on the laws of animal life, in which he not only adopted Buffon's theory of the origin of species by evolution, but also laid down as the chief cause of such development the actions and needs of the animals themselves. According to Dr. Erasmus Darwin, animals came to vary from one another chiefly because they were always altering their habits and voluntarily accommodating themselves to new actions and positions in life. His work produced comparatively little effect upon the world at large in his own time, but it had immense influence upon the next great prophet of evolution, Lamarck, and through Lamarck on Lyell, Charles Darwin, Herbert Spencer, and the modern school of evolutionists generally. We shall consider his views in greater detail when we pass from the spiritual to the physical antecedents of Charles Darwin.

It was in 1801 that Lamarck first gave to the world his epoch-making speculations and suggestions on the origin of species; and from that date to the day of his death, in 1831, the unwearied old philosopher continued to devote his whole time and energy, in blindness and poverty, to the elucidation of this interesting and important subject. A bold, acute, and vigorous thinker, trained in the great school of Diderot and D'Alembert, with something of the vivid Celtic poetic imagination, and a fearless habit of forming his own conclusions irrespective of common or preconceived ideas, Lamarck went to the very root of the matter in the most determined fashion, and openly proclaimed in the face of frowning officialism under the Napoleonic reaction his profound conviction that all species, including man, were descended by modification from one or more primordial forms. In Charles Darwin's own words, 'He first did the eminent service of arousing attention to the probability of all change, in the organic as well as in the inorganic world, being the result of law and not of miraculous interposition. Lamarck seems to have been chiefly led to his conclusion on the gradual change of species by the difficulty of distinguishing species and varieties, by the almost perfect gradation of forms in certain groups, and by the analogy of domestic productions. With respect to the means of modification, he attributed something to the direct action of the physical conditions of life, something to the crossing of already existing forms, and much to use and disuse, that is, to the effects of habit. To this latter agency he seems to attribute all the beautiful adaptations in nature – such as the long neck of the giraffe for browsing on the branches

of trees,' He believed, in short, that animals had largely developed themselves, by functional effort followed by increased powers and abilities.

Lamarck's great work, the 'Philosophie Zoologique,' though opposed by the austere and formal genius of the immortal Cuvier – a reactionary biological conservative and obscurantist, equal to the enormous task of mapping out piecemeal with infinite skill and power the separate provinces of his chosen science, but incapable of taking in all the bearings of the whole field at a single vivid and comprehensive sweep – Lamarck's great work produced a deep and lasting impression upon the entire subsequent course of evolutionary thought in scientific Europe. True, owing to the retrograde tendencies of the First Empire, it caused but little immediate stir at the precise moment of its first publication; but the seed it sowed sank deep, and, lying fallow long in men's minds, bore fruit at last in the next generation with the marvellous fecundity of the germs of genius. Indeed, from the very beginning of the present century, a ferment of inquiry on the subject of creation and evolution was everywhere obvious among speculative thinkers. The profound interest which Goethe took in the dispute on this very subject in the French Académie des Sciences between Cuvier and Geoffroy St. Hilaire, amid the thundering guns of a threatened European convulsion, was but a solitary symptom of the general stir which preceded the gestation and birth of the Darwinian hypothesis. It is impossible to take up any scientific memoirs or treatises of the first half of our own century without seeing at a glance how every mind of high original scientific importance was permeated and disturbed by the fundamental questions aroused, but not fully answered, by Buffon, Lamarck, and Erasmus Darwin. In Lyell's letters and in Agassiz's lectures, in the 'Botanic Journal' and the 'Philosophical Transactions,' in treatises on Madeira beetles and the Australian flora, we find everywhere the thoughts of men profoundly influenced in a thousand directions by this universal evolutionary solvent and leaven.

And while the world of thought was thus seething and moving restlessly before the wave of ideas set in motion by these various independent philosophers, another group of causes in another field was rendering smooth the path beforehand for the future champion of the amended evolutionism. Geology on the one hand and astronomy on the other were making men's minds gradually familiar with the conception of slow natural development, as opposed to immediate and miraculous creation.

The rise of geology had been rapid and brilliant. In the last century it had been almost universally believed that fossil organisms were the relics of submerged and destroyed worlds, strange remnants of successive terrible mundane catastrophes. Cuvier himself, who had rendered immense services to geological science by his almost unerring reconstructions of extinct animals, remained a partisan of the old theory of constant cataclysms and fresh creations throughout his whole life; but Lamarck, here as elsewhere the prophet of the modern uniformitarian concept of nature, had already announced his grand idea that the ordinary process of natural laws sufficed to account for all the phenomena of the earth's crust. In England, William Smith, the ingenious land surveyor, riding up and down on his daily task over the face of the country, became convinced by his observations in the first years of the present century that a fixed order of sequence could everywhere be traced among the various superincumbent geological strata. Modern scientific geology takes its rise from the moment of this luminous and luminiferous discovery. With astonishing rapidity the sequence of strata was everywhere noted, and the succession of characteristic fossils mapped out, with the result of showing, however imperfectly at first, that the history of organic life upon the globe had followed a slow and regular course of constant development. Immediately whole schools of eager workers employed themselves in investigating in separate detail the phenomena of these successive stages of unfolding life. Murchison, fresh from the Peninsular campaign, began to study the dawn of organic history in the gloom of the Silurian and Cambrian epochs. A group of less articulate but not less active workers like Buckland and Mantell performed similar services for the carboniferous, the wealden, and the tertiary deposits. Sedgwick endeavoured to co-ordinate

the whole range of then known facts into a single wide and comprehensive survey. De La Beche, Phillips, and Agassiz added their share to the great work of reconstruction. Last of all, among those who were contemporary and all but coeval with Charles Darwin himself, Lyell boldly fought out the battle of 'uniformitarianism,' proving, with all the accumulated weight of his encyclopædic and world-wide knowledge, that every known feature of geological development could be traced to the agency of causes now in action, and illustrated by means of slow secular changes still actually taking place on earth before our very eyes.

The influence of these novel conceptions upon the growth and spread of evolutionary ideas was far-reaching and twofold. In the first place, the discovery of a definite succession of nearly related organic forms, following one another with evident closeness through the various ages, inevitably suggested to every inquiring observer the possibility of their direct descent one from the other. In the second place, the discovery that geological formations were not really separated each from its predecessor by violent revolutions, but were the result of gradual and ordinary changes, discredited the old idea of frequent fresh creations after each catastrophe, and familiarised the minds of men of science with the alternative notion of slow and natural evolutionary processes. The past was seen to be in effect the parent of the present; the present was recognised as the child of the past.

Current astronomical theories also pointed inevitably in the same direction. Kant, whose supereminent fame as a philosopher has almost overshadowed his just claims as a profound thinker in physical science, had already in the third quarter of the eighteenth century arrived at his sublime nebular hypothesis, in which he suggested the possible development of stars, suns, planets, and satellites by the slow contraction of very diffuse and incandescent haze-clouds. This magnificent cosmical conception was seized and adapted by the genius of Laplace in his celestial system, and made familiar through his great work to thinking minds throughout the whole of Europe. In England it was further modified and remodelled by Sir William Herschel, whose period of active investigation coincided in part with Charles Darwin's early boyhood. The bearings of the nebular hypothesis upon the rise of Darwinian evolutionism are by no means remote: the entire modern scientific movement forms, in fact, a single great organic whole, of which the special doctrine of biological development is but a small separate integral part. All the theories and doctrines which go to make it up display the one common trait that they reject the idea of direct creative interposition from without, and attribute the entire existing order of nature to the regular unfolding of one undeviating continuous law.

Yet another factor in the intellectual stir and bustle of the time must needs be mentioned even in so short and cursory a sketch as this of the causes which led to the Darwinian crisis. In 1798, Thomas Malthus, a clergyman of the Church of England, published the first edition of his famous and much-debated 'Essay on the Principle of Population.' Malthus was the first person who ever called public attention to the tendency of population to increase up to the utmost limit of subsistence, as well as to the necessary influence of starvation in checking its further development beyond that point. Though his essay dealt only with the question of reproduction in human societies, it was clear that it possessed innumerable analogies in every domain of animal and vegetable life. The book ran through many successive editions with extraordinary rapidity for a work of its class, it was fiercely attacked and bravely defended, it caused an immense amount of discussion and debate, and besides its marvellous direct influence as a germinal power upon the whole subsequent course of politico-economical and sociological thought, it produced also a remarkable indirect influence on the side current of biological and speculative opinion. In particular, as we shall more fully see hereafter, it had an immediate effect in suggesting to the mind of the great naturalist who forms our present subject the embryo idea of 'natural selection.'

Such then was the intellectual and social world into which, early in the present century, Charles Darwin found himself born. Everywhere around him in his childhood and youth these great but formless evolutionary ideas were brewing and fermenting. The scientific society of his

elders and of the contemporaries among whom he grew up was permeated with the leaven of Laplace and of Lamarck, of Hutton and of Herschel. Inquiry was especially everywhere rife as to the origin and nature of specific distinctions among plants and animals. Those who believed in the doctrine of Buffon and of the 'Zoonomia' and those who disbelieved in it, alike, were profoundly interested and agitated in soul by the far-reaching implications of that fundamental problem. On every side evolutionism, in its crude form, was already in the air. Long before Charles Darwin himself published his conclusive 'Origin of Species,' every thinking mind in the world of science, elder and younger, was deeply engaged upon the self-same problem. Lyell and Horner in alternate fits were doubting and debating. Herbert Spencer had already frankly accepted the new idea with the profound conviction of *a priori* reasoning. Agassiz was hesitating and raising difficulties. Treviranus was ardently proclaiming his unflinching adhesion. Oken was spinning in metaphysical Germany his fanciful parodies of the Lamarckian hypothesis. Among the depths of Brazilian forests Bates was reading the story of evolution on the gauze-like wings of tropical butterflies. Under the scanty shade of Malayan palm-trees Wallace was independently spelling out in rude outline the very theory of survival of the fittest, which Charles Darwin himself was simultaneously perfecting and polishing among the memoirs and pamphlets of his English study. Wollaston in Madeira was pointing out the strange adaptations of the curious local snails and beetles. Von Buch in the Canaries was coming to the conclusion that varieties may be slowly changed into permanent species. Lecoq and Von Baer were gradually arriving, one by the botanical route, the other by the embryological, at the same opinion. Before Charles Darwin was twenty, Dean Herbert had declared from the profound depth of his horticultural knowledge that kinds were only mere fixed sports; and Patrick Matthew, in the appendix to a work on 'Naval Timber,' had casually developed, without perceiving its importance, the actual distinctive Darwinian doctrine of natural selection. Robert Chambers published in 1844 his 'Vestiges of Creation,' in which Lamarck's theory was impressed and popularised under a somewhat spoilt and mistaken form: it was not till 1859 that the first edition of the 'Origin of Species' burst like a thunderbolt upon the astonished world of unprepared and unscientific thinkers.

This general attitude of interest and inquiry is of deep importance to the proper comprehension of Charles Darwin's life and work, and that for two distinct reasons. In the first place, the universal stir and deep prying into evolutionary questions which everywhere existed among scientific men in his early days was naturally communicated to a lad born of a scientific family, and inheriting directly in blood and bone the biological tastes and tendencies of Erasmus Darwin. In the second place, the existence of such a deep and wide-spread curiosity as to ultimate origins, and the common prevalence of profound uniformitarian and evolutionary views among philosophers and thinkers, made the acceptance of Charles Darwin's particular theory, when it at last arrived, a comparatively easy and certain matter, because by it the course of organic development was assimilated, on credible grounds, to the course of all other development in general, as then already widely recognised. The first consideration helps us to account in part for the man himself; the second consideration helps us even more to account for the great work which he was enabled in the end so successfully to accomplish.

CHAPTER II
CHARLES DARWIN AND HIS ANTECEDENTS

From the environment let us turn to the individual; from the world in which the man moved to the man who moved in it, and was in time destined to move it.

Who was he, and whence did he derive his exceptional energy and intellectual panoply?

Erasmus Darwin, the grandfather, the first of the line in whom the distinctive Darwinian strain of intellect overtly displayed itself, was the son of one Robert Darwin, a gentleman of Nottinghamshire, 'a person of curiosity,' with 'a taste for literature and science;' so that for four generations at least, in the paternal line, the peculiar talents of the Darwin family had been highly cultivated in either direction. Robert Darwin was an early member of the Spalding Club, a friend of Stukeley the antiquary, and an embryo geologist, after the fantastic, half-superstitious fashion of his own time. Of his four sons, both Robert, the eldest, and Erasmus, the youngest, were authors and botanists. Erasmus himself was a Cambridge man, and his natural bent of mind and energy led him irresistibly on to the study of medicine. Taking his medical degree at his own university, and afterwards preparing for practice by attending Hunter's lectures in London, besides going through the regular medical course at Edinburgh, the young doctor finally settled down as a physician at Nottingham, whence shortly afterward he removed to Lichfield, then the centre of a famous literary coterie. So large a part of Charles Darwin's remarkable idiosyncrasy was derived by heredity from his paternal grandfather, that it may be worth while to dwell a little here in passing on the character and career of this brilliant precursor of the great evolutionist. Both in the physical and in the spiritual sense, Erasmus Darwin was one among the truest and most genuine ancestors of his grandson Charles.

A powerful, robust, athletic man, in florid health and of temperate habits, yet with the full-blooded tendency of the eighteenth century vividly displayed in his ample face and broad features, Erasmus Darwin bubbled over with irrepressible vivacity, the outward and visible sign of that overflowing energy which forms everywhere one of the most marked determining conditions of high genius. Strong in body and strong in mind, a teetotaler before teetotalism, an abolitionist before the anti-slavery movement, he had a great contempt for weaknesses and prejudices of every sort, and he rose far superior to the age in which he lived in breadth of view and freedom from preconceptions. The eighteenth century considered him, in its cautious, cut-and-dried fashion, a man of singular talent but of remarkably eccentric and unsafe opinions. Unfortunately for his lasting fame, Dr. Darwin was much given to writing poetry; and this poetry, though as ingenious as everything else he did, had a certain false gallop of verse about it which has doomed it to become since Canning's parody a sort of warning beacon against the worst faults of the post-Augustan decadence in the ten-syllabled metre. Nobody now reads the 'Botanic Garden' except either to laugh at its exquisite extravagances, or to wonder at the queer tinsel glitter of its occasional clever rhetorical rhapsodies.

But in his alternative character of philosophic biologist, rejected by the age which swallowed his poetry all applausive, Erasmus Darwin is well worthy of the highest and deepest respect, as a prime founder and early prophet of the evolutionary system. His 'Zoonomia,' 'which, though ingenious, is built upon the most absurd hypothesis' – as men still said only thirty years ago – contains in the germ the whole theory of organic development as understood up to the very moment of the publication of the 'Origin of Species.' In it Dr. Darwin calls attention to 'the great changes introduced into various animals by artificial or accidental cultivation,' a subject afterwards fully elucidated by his greater grandson in his work on 'The Variation of Animals and Plants under Domestication.' He specially notes 'the immense changes of shape and colour' produced by man in

rabbits and pigeons, the very species on which Charles Darwin subsequently made some of his most remarkable and interesting observations. More than any previous writer, Erasmus Darwin, with 'prophetic sagacity,' insisted strongly on the essential unity of parent and offspring – a truth which lies at the very base of all modern philosophical biology. 'Owing to the imperfection of language,' wrote the Lichfield doctor nearly a hundred years ago, 'the offspring is termed a new animal, but is in truth a branch or elongation of the parent, since a part of the embryon-animal is or was a part of the parent, and therefore may retain some of the habits of the parent system.' He laid peculiar stress upon the hereditary nature of some acquired properties, such as the muscles of dancers or jugglers, and the diseases incidental to special occupations. Nay, he even anticipated his great descendant in pointing out that varieties are often produced at first as mere 'sports' or accidental variations, as in the case of six-fingered men, five-clawed fowls, or extra-toed cats, and are afterwards handed down by heredity to succeeding generations. Charles Darwin would have added that if these new stray peculiarities happened to prove advantageous to the species they would be naturally favoured in the struggle for existence, while if they proved disadvantageous, or even neutral, they would die out at once or be bred out in the course of a few crosses. That last truth of natural selection was the only cardinal one in the evolutionary system on which Erasmus Darwin did not actually forestall his more famous and greater namesake. For its full perception, the discovery of Malthus had to be collated with the speculations of Buffon.

'When we revolve in our minds,' says the eighteenth century prophet of evolution, 'the great similarity of structure which obtains in all the warm-blooded animals, as well quadrupeds, birds, and amphibious animals, as in mankind; from the mouse and bat to the elephant and whale; one is led to conclude that they have alike been produced from a similar living filament. In some this filament in its advance to maturity has acquired hands and fingers with a fine sense of touch, as in mankind. In others it has acquired claws or talons, as in tigers and eagles. In others, toes with an intervening web or membrane, as in seals and geese. In others it has acquired cloven hoofs, as in cows and swine; and whole hoofs in others, as in the horse: while in the bird kind this original living filament has put forth wings instead of arms or legs, and feathers instead of hair.' This is a very crude form of evolutionism indeed, but it is leading up by gradual stages to the finished and all-sided philosophy of physical life, which at last definitely formulates itself through the mouth of Charles Darwin. We shall see hereafter wherein Erasmus Darwin's conception of development chiefly failed – in attributing evolution for the most part to the exertions and endeavours of the animal itself, rather than to inevitable survival of the fittest among innumerable spontaneous variations – but we must at least conclude our glimpse of his pregnant and suggestive work by quoting its great fundamental *aperçu*: – 'As the earth and ocean were probably peopled with vegetable productions long before the existence of animals, and many families of these animals long before other families of them, shall we conjecture that one and the same kind of living filament is and has been the cause of all organic life?'

A few lines from the 'Temple of Nature,' one of Erasmus Darwin's poetic rhapsodies, containing his fully matured views on the origin of living creatures, may be worth reproduction in further elucidation of his philosophical position: —

'Organic life beneath the shoreless waves
Was born, and nursed in ocean's pearly caves;
First forms minute, unseen by spheric glass.
Move on the mud, or pierce the watery mass;
These, as successive generations bloom,
New powers acquire, and larger limbs assume;
Whence countless groups of vegetation spring,
And breathing realms of fin and feet and wing.'

Have we not here the very beginnings of Charles Darwin? Do we not see, in these profound and fundamental suggestions, not merely hints as to the evolution of evolution, but also as to the evolution of the evolutionist?

On the other hand, though Erasmus Darwin defined a fool to his friend Edgeworth as 'a man who never tried an experiment in his life,' he was wanting himself in the rigorous and patient inductive habit which so strikingly distinguished his grandson Charles. That trait, as we shall presently see, the biological chief of the nineteenth century derived in all probability from another root of his genealogical tree. Erasmus Darwin gave us brilliant suggestions rather than cumulative proof: he apologised in his 'Zoonomia' for 'many conjectures not supported by accurate investigation or conclusive experiments,' Such an apology would have been simply impossible to the painstaking spirit of his grandson Charles.

Erasmus Darwin was twice married. His first wife was Mary, daughter of Mr. Charles Howard, of Lichfield, and it was her son, Robert Waring Darwin, who became the father of our hero, Charles. It is fashionable to say, in this and sundry other like cases, that the mental energy skips a generation. People have said so in the case of that intermediate Mendelssohn who was son of Moses Mendelssohn, the philosopher, and father of Felix Bartholdy Mendelssohn, the composer – that mere link in a marvellous chain who was wont to observe of himself in the decline of life, that in his youth he was called the son of the great Mendelssohn, and in his old age the father of the great Mendelssohn. As a matter of fact, one may fairly doubt whether such a case of actual skipping is ever possible in the nature of things. In the particular instance of Robert Waring Darwin at least we may be pretty sure that the distinctive Darwinian strain of genius lay merely latent rather than dormant: that it did not display itself to the world at large, but that it persisted silently as powerful as ever within the remote recesses of the thinking organism. Not every man brings out before men all that is within him. Robert Waring Darwin was a physician at Shrewsbury; and he attained at least sufficient scientific eminence in his own time to become a Fellow of the Royal Society, in days when that honour was certainly not readily conferred upon country doctors of modest reputation. Charles Darwin says of him plainly, 'He was incomparably the most acute observer whom I ever knew.' It may well have been that Robert Darwin lived and died, as his famous son lived for fifty years of his great life, in comparative silence and learned retirement; for we must never forget that if Charles Darwin had only completed the first half century of his laborious existence, he would have been remembered merely as the author of an entertaining work on the voyage of the 'Beagle,' a plausible theory of coral islands, and a learned monograph on the fossil barnacles. During all those years, in fact, he had really done little else than collect material for the work of his lifetime. If we judge men by outward performance only, we may often be greatly mistaken in our estimates: potentiality is wider than actuality; what a man does is never a certain or extreme criterion of what he can do.

The Darwins, indeed, were all a mighty folk, of varied powers and varied attainments. Erasmus's brother, Robert, was the author of a work on botany, which long enjoyed a respectable repute. Of his sons, one, Sir Francis Darwin, was noted as a keen observer of animals; a second, Charles, who died at twenty-one, was already the author of a very valuable medical essay; while the third, Robert, was the Shrewsbury F.R.S., the father of our great evolutionary thinker. And among Charles Darwin's own cousins, one is Mr. Hensleigh Wedgwood, the philologist; a second was the late Sir Henry Holland; and a third is Mr. Francis Galton, the author of that essentially Darwinian book, 'Hereditary Genius.'

Robert Waring Darwin took to himself a wife from another very great and eminent family. He married Susannah Wedgwood, daughter of Josiah Wedgwood, the famous potter; and from these two silent representatives of powerful stocks, Charles Robert Darwin, the father of modern evolutionary biology, was born at Shrewsbury, on February the 12th, 1809. That Wedgwood

connection, again, is no mere casual or unimportant incident in the previous life-history of the Darwinian originality; it throws a separate clear light of its own upon the peculiar and admirably compounded idiosyncrasy of Charles Darwin.

A man, indeed, owes on the average quite as much to his mother's as to his father's family. It is a mere unscientific old-world prejudice which makes us for the most part count ancestry in the direct ascending male line alone, to the complete neglect of the equally important maternal pedigree. Prom the biological point of view, at least, every individual is a highly complex compound of hereditary elements, a resultant of numerous converging forces, a meeting place of two great streams of inheritance, each of which is itself similarly made up by the like confluence of innumerable distinct prior tributaries. Between these two it is almost impossible for us accurately to distribute any given individuality. How much Charles Darwin owed to the Darwins, and how much he owed in turn to the Wedgwoods, no man is yet psychologist enough or physiologist enough to say. But that he owed a great deal to either strong and vigorous strain we may even now quite safely take for granted.

The Wedgwood family were 'throwers' by handicraft, superior artisans long settled at Burslem, in the Staffordshire potteries. Josiah, the youngest of thirteen children, lamed by illness in early life, was turned by this happy accident from his primitive task as a 'thrower' to the more artistic and original work of producing ornamental coloured earthenware. Skilful and indefatigable, of indomitable energy and with great powers of forcing his way in life against all obstacles, young Wedgwood rose rapidly by his own unaided exertions to be a master potter, and a manufacturer of the famous unglazed black porcelain. Those were the darkest days of industrial art and decorative handicraft in modern England. Josiah Wedgwood, by his marked originality and force of character, succeeded in turning the current of national taste, and creating among us a new and distinctly higher type of artistic workmanship. His activity, however, was not confined to his art alone, but found itself a hundred other different outlets in the most varied directions. When his potteries needed enlargement to meet the increased demand, he founded for the hands employed upon his works the model industrial village of Etruria. When Brindley began cutting artificial waterways across the broad face of central England, it was in the great potter that he found his chief ally in promoting the construction of the Grand Trunk Canal. Wedgwood, indeed, was a builder of schools and a maker of roads; a chemist and an artist; a friend of Watt and an employer of Flaxman. In short, like Erasmus Darwin, he possessed that prime essential in the character of genius, an immense underlying stock of energy. And with it there went its best concomitant, the 'infinite capacity for taking pains.' Is it not probable that in their joint descendant, the brilliant but discursive and hazardous genius of Erasmus Darwin was balanced and regulated by soberer qualities inherited directly from the profound industry of the painstaking potter? When later on we find Charles Darwin spending hours in noting the successive movements of the tendrils in a plant, or watching for long years the habits and manners of earthworms in flower-pots, may we not reasonably conjecture that he derived no little share of his extraordinary patience, carefulness, and minuteness of handicraft from his mother's father, Josiah Wedgwood?

Such, then, were the two main component elements, paternal and maternal, from which the striking personality of Charles Darwin was no doubt for the most part ultimately built up.

CHAPTER III
EARLY DAYS

As the Chester express steams out of Shrewsbury station, you see on your left, overhanging the steep bank of Severn, a large, square, substantial-looking house, known as the Mount, the birthplace of the author of the 'Origin of Species.' There, in the comfortable home he had built for himself, Dr. Robert Darwin, the father, lived and worked for fifty years of unobtrusive usefulness. He had studied medicine at Edinburgh and Leyden, and had even travelled a little in Germany, before he settled down in the quiet old Salopian town, where for half a century his portly figure and yellow chaise were familiar objects of the country-side for miles around. Among a literary society which included Coleridge's friends, the Tayleurs, and where Hazlitt listened with delight to the great poet's 'music of the spheres,' in High Street Unitarian Chapel, the Mount kept up with becoming dignity the family traditions of the Darwins and the Wedgwoods as a local centre of sweetness and light.

On February the 12th, 1809, Charles Darwin first saw the light of day in this his father's house at Shrewsbury. Time and place were both propitious. Born in a cultivated scientific family, surrounded from his birth by elevating influences, and secured beforehand from the cramping necessity of earning his own livelihood by his own exertions, the boy was destined to grow up to full maturity in the twenty-one years of slow development that immediately preceded the passing of the first Reform Act. The thunder of the great European upheaval had grown silent at Waterloo when he was barely six years old, and his boyhood was passed amid country sights and sounds during that long period of reconstruction and assimilation which followed the fierce volcanic outburst of the French Revolution. Happy in the opportunity of his birth, he came upon the world eight years after the first publication of Lamarck's remarkable speculations, and for the first twenty-two years of his life he was actually the far younger contemporary of the great French evolutionary philosopher. Eleven years before his arrival upon the scene Malthus had set forth his 'Principle of Population.' Charles Darwin thus entered upon a stage well prepared for him, and he entered it with an idiosyncrasy exactly adapted for making the best of the situation. The soil had been thoroughly turned and dressed beforehand: Charles Darwin's seed had only to fall upon it in order to spring up and bear fruit a hundredfold, in every field of science or speculation.

For it was not biology alone that he was foredoomed to revolutionise, but the whole range of human thought, and perhaps even ultimately of human action.

Is it mere national prejudice which makes one add with congratulatory pleasure that Darwin was born in England, rather than in France, in Germany, or in America? Perhaps so; perhaps not. For the English intellect does indeed seem more capable than most of uniting high speculative ability with high practical skill and experience: and of that union of rare qualities Darwin himself was a most conspicuous example. It is probable that England has produced more of the great organising and systematising intellects than any other modern country.

Among those thinkers in his own line who stood more nearly abreast of Darwin in the matter of age, Lyell was some eleven years his senior, and contributed not a little (though quite unconsciously) by his work and conclusions to the formation of Darwin's own peculiar scientific opinions. The veteran Owen, who still survives him, was nearly five years older than Darwin, and also helped to a great extent in giving form and exactness to his great contemporary's anatomical ideas. Humboldt, who preceded our English naturalist in the matter of time by no less than forty years, might yet almost rank as coeval in some respects, owing to his long and active life, his late maturity, and the very recent date of his greatest and most thought-compelling work, the 'Cosmos' (begun when Humboldt was seventy-five, and finished when he lacked but ten years of his

century), in itself a sort of preparation for due acceptance of the Darwinian theories. In fact, as many as fifty years of their joint lives coincided entirely one with the other's. Agassiz antedated Darwin by two years. On the other hand, among the men who most helped on the recognition of Darwin's theories, Hooker and Lewes were his juniors by eight years, Herbert Spencer by eleven, Wallace by thirteen, and Huxley by sixteen. His cousin, Francis Galton, another grandson of Erasmus Darwin, and joint inheritor of the distinctive family biological ply, was born at the same date as Alfred Russell Wallace, thirteen years after Charles Darwin. In such a goodly galaxy of workers was the Darwinian light destined to shine through the middle of the century, as one star excelleth another in glory.

Charles Darwin was the second son: but nature refuses doggedly to acknowledge the custom of primogeniture. His elder brother, Erasmus, a man of mute and inarticulate ability, with a sardonic humour alien to his race, extorted unwonted praise from the critical pen of Thomas Carlyle, who 'for intellect rather preferred him to his brother Charles.' But whatever spark of the Darwinian genius was really innate in Erasmus the Less died with him unacknowledged.

The boy was educated (so they call it) at Shrewsbury Grammar School, under sturdy Sam Butler, afterwards Bishop of Lichfield; and there he picked up so much Latin and Greek as was then considered absolutely essential to the due production of an English gentleman. Happily for the world, having no taste for the classics, he escaped the ordeal with little injury to his individuality. His mother had died while he was still a child, but his father, that 'acute observer,' no doubt taught him to know and love nature. At sixteen he went to Edinburgh University, then rendered famous by a little knot of distinguished professors, and there he remained for two years. Already at school he had made himself notable by his love of collecting – the first nascent symptom of the naturalist bent. He collected everything, shells, eggs, minerals, coins, nay, since postage stamps were then not yet invented, even franks. But at Edinburgh he gave the earliest distinct evidence of his definite scientific tastes by contributing to the local academic society a paper on the floating eggs of the common sea-mat, in which he had even then succeeded in discovering for the first time organs of locomotion. Thence he proceeded to Christ's College, Cambridge. The Darwins were luckily a Cambridge family: luckily, let us say, for had it been otherwise – had young Darwin been distorted from his native bent by Plato and Aristotle, and plunged deep into the mysteries of Barbara and Celarent, as would infallibly have happened to him at the sister university – who can tell how long we might have had to wait in vain for the 'Origin of Species' and the 'Descent of Man'? But Cambridge, which rejoiced already in the glory of Newton, was now to match it by the glory of Darwin. In its academical course, the mathematical wedge had always kept open a dim passage for physical science; and at the exact moment when Darwin was an undergraduate at Christ's – from 1827 to 1831 – the university had the advantage of several good scientific teachers, and amongst them one, Professor Henslow, a well-known botanist, who took a special interest in young Darwin's intellectual development. There, too, he met with Sedgwick, Airy, Ramsay, and numerous other men of science, whose intercourse with him must no doubt have contributed largely to mould and form the future cast of his peculiar philosophical idiosyncrasy.

It was to Henslow's influence that Darwin in later years attributed in great part his powerful taste for natural history. But in truth the ascription of such high praise to his early teacher smacks too much of the Darwinian modesty to be accepted at once without demur by the candid critic. The naturalist, like the poet, is born, not made. How much more, then, must this needs be the case with the grandson of Erasmus Darwin and of Josiah Wedgwood? As a matter of fact, already at Edinburgh the lad had loved to spend his days among the sea-beasts and wrack of the Inches in the Firth of Forth; and it was through the instrumentality of his 'brother entomologists' that he first became acquainted with Henslow himself when he removed to Cambridge. The good professor could not make him into a naturalist: inherited tendencies and native energies had done that for him already from his very cradle.

'Doctrina sed vim promovet insitam;' and it was well that Darwin took up at Cambridge with the study of geology as his first love. For geology was then the living and moving science, as astronomy had been in the sixteenth century, and as biology is at the present day – the growing-point, so to speak, of European development, whence all great things might naturally be expected. Moreover, it was and is the central science of the concrete class, having relations with astronomy on the one hand, and with biology on the other; concerned alike with cosmical chances or changes on this side, and with the minutest facts of organic nature on that; the meeting-place and border-land of all the separate branches of study that finally bear upon the complex problems of our human life. No other subject of investigation was so well calculated to rouse Darwin's interest in the ultimate questions of evolution or creation, of sudden cataclysm or gradual growth, of miraculous intervention or slow development. Here, if anywhere, his enigmas were all clearly propounded to him by the inarticulate stony sphinxes; he had only to riddle them out for himself as he went along in after years with the aid of the successive side-lights thrown upon the world by the unconnected lanterns of Lamarck and of Malthus.

Fortunately for us, then, Darwin did not waste his time at Cambridge over the vain and frivolous pursuits of the classical tripos. He preferred to work at his own subjects in his own way, and to leave the short-lived honours of the schools to those who cared for them and for nothing higher. He came out with the *o# πολλοί* in 1831, and thenceforth proceeded to study life in the wider university for which his natural inclinations more properly fitted him. The world was all before him where to choose, and he chose that better part which shall not be taken away from him as long as the very memory of science survives.

CHAPTER IV
DARWIN'S WANDER-YEARS

Scarcely had Darwin taken his pass degree at Cambridge when the great event of his life occurred which, more than anything else perhaps, gave the final direction to his categorical genius in the line it was thenceforth so successfully to follow. In the autumn of 1831, when Darwin was just twenty-two, it was decided by Government to send a ten-gun brig, the 'Beagle,' under command of Captain Fitzroy, to complete the unfinished survey of Patagonia and Tierra del Fuego, to map out the shores of Chili and Peru, to visit several of the Pacific archipelagoes, and to carry a chain of chronometrical measurements round the whole world. This was an essentially scientific expedition, and Captain Fitzroy, afterwards so famous as the meteorological admiral, was a scientific officer of the highest type. He was anxious to be accompanied on his cruise by a competent naturalist who would undertake the collection and preservation of the animals and plants discovered on the voyage, for which purpose he generously offered to give up a share of his own cabin accommodation. Professor Henslow seized upon the opportunity to recommend for the post his promising pupil, young Darwin, 'grandson of the poet.' Darwin gladly volunteered his services without salary, and partly paid his own expenses on condition of being permitted to retain in his own possession the animals and plants he collected on the journey. The 'Beagle' set sail from Devonport on December the 27th, 1831; she returned to Falmouth on October the 2nd, 1836.

That long five years' cruise around the world, the journal of which Darwin has left us in the 'Voyage of the "Beagle,"' proved a marvellous epoch in the great naturalist's quiet career. It left its abiding mark deeply imprinted on all his subsequent life and thinking. Lamarck and Erasmus Darwin were cabinet biologists, who had never beheld with their own eyes the great round world and all that therein is; Charles Darwin had the inestimable privilege of seeing for himself, at first hand, a large part of the entire globe and of the creatures that inhabit it. Even to have caught one passing glimpse of the teeming life of the tropics is in itself an education; to the naturalist it is more, it is a revelation. Our starved little northern fauna and flora, the mere leavings of the vast ice sheets that spread across our zone in the glacial epoch, show us a world depopulated of all its largest, strangest, and fiercest creatures; a world dwarfed in all its component elements, and immensely differing in ten thousand ways from that rich, luxuriant, over-stocked hot-house in which the first great problems of evolution were practically worked out by survival of the fittest. But the tropics preserve for us still in all their jungles something of the tangled, thickly-peopled aspect which our planet must have presented for countless ages in all latitudes before the advent of primæval man. We now know that throughout the greater part of geological time, essentially tropical conditions existed unbroken over the whole surface of the entire earth, from the Antarctic continent to the shores of Greenland; so that some immediate acquaintance at least with the equatorial world is of immense value to the philosophical naturalist for the sake of the analogies it inevitably suggests; and it is a significant fact that almost all those great and fruitful thinkers who in our own time have done good work in the wider combination of biological facts have themselves passed a considerable number of years in investigating the conditions of tropical nature. Europe and England are at the ends of the earth; the tropics are biological head-quarters. The equatorial zone is therefore the true school for the historian of life in its more universal and lasting aspects.

Nor was that all. The particular countries visited by the 'Beagle' during the course of her long and varied cruise happened to be exactly such as were naturally best adapted for bringing out the latent potentialities of Darwin's mind, and suggesting to his active and receptive brain those deep problems of life and its environment which he afterwards wrought out with such subtle skill and such consummate patience in the 'Origin of Species' and the 'Descent of Man.' The Cape de

Verdes, and the other Atlantic islands, with their scanty population of plants and animals, composed for the most part of waifs and strays drifted to their barren rocks by ocean currents, or blown out helplessly to sea by heavy winds; Brazil, with its marvellous contrasting wealth of tropical luxuriance and self-strangling fertility, a new province of interminable delights to the soul of the enthusiastic young collector; the South American pampas, with their colossal remains of extinct animals, huge geological precursors of the stunted modern sloths and armadillos that still inhabit the self-same plains; Tierra del Fuego, with its almost Arctic climate, and its glimpses into the secrets of the most degraded savage types; the vast range of the Andes and the Cordilleras, with their volcanic energy and their closely crowded horizontal belts of climatic life; the South Sea Islands, those paradises of the Pacific, Hesperian fables true, alike for the lover of the picturesque and the biological student; Australia, that surviving fragment of an extinct world, with an antiquated fauna whose archaic character still closely recalls the European life of ten million years back in the secondary epoch: all these and many others equally novel and equally instructive passed in long alternating panorama before Darwin's eyes, and left their images deeply photographed for ever after on the lasting tablets of his retentive memory. That was the real great university in which he studied nature and read for his degree. Our evolutionist was now being educated.

Throughout the whole of the journal of this long cruise, which Darwin afterwards published in an enlarged form, it is impossible not to be struck at every turn with the way in which his inquisitive mind again and again recurs to the prime elements of those great problems towards whose solution he afterwards so successfully pointed out the path. The Darwinian ideas are all already there in the germ; the embryo form of the 'Origin of Species' plays in and out on every page with the quaintest elusiveness. We are always just on the very point of catching it; and every now and again we do actually all but catch it in essence and spirit, though ever still its bodily shape persistently evades us. Questions of geographical distribution, of geological continuity, of the influence of climate, of the modifiability of instinct, of the effects of surrounding conditions, absorb the young observer's vivid interest at every step, wherever he lands. He is all unconsciously collecting notes and materials in profuse abundance for his great work; he is thinking in rough outline the new thoughts which are hereafter to revolutionise the thought of humanity.

Five years are a great slice out of a man's life: those five years of ceaseless wandering by sea and land were spent by Charles Darwin in accumulating endless observations and hints for the settlement of the profound fundamental problems in which he was even then so deeply interested. The 'Beagle' sailed from England to the Cape de Verdes, and already, even before she had touched her first land, the young naturalist had observed with interest that the impalpably fine dust which fell on deck contained no less than sixty-seven distinct organic forms, two of them belonging to species peculiar to South America. In some of the dust he found particles of stone so very big that they measured 'above the thousandth of an inch square;' and after this fact, says the keen student, 'one need not be surprised at the diffusion of the far lighter and smaller sporules of cryptogamic plants.' Would Erasmus Darwin have noticed these minute points and their implications one wonders? Probably not. May we not see in the observation partly the hereditary tendencies of Josiah Wedgwood towards minute investigation and accuracy of detail, partly the influence of the scientific time-wave, and the careful training under Professor Henslow? Erasmus Darwin comes before us rather as the brilliant and ingenious amateur, his grandson Charles as the instructed and fully equipped final product of the scientific schools.

At St. Paul's Rocks, once more, a mass of new volcanic peaks rising abruptly from the midst of the Atlantic, the naturalist of the 'Beagle' notes with interest that feather and dirt-feeding and parasitic insects or spiders are the first inhabitants to take up their quarters on recently formed oceanic islands. This problem of the peopling of new lands, indeed, so closely connected with the evolution of new species, necessarily obtruded itself upon his attention again and again during his five years' cruise; and in some cases, especially that of the Galapagos Islands, the curious insular

faunas and floras which he observed upon this trip, composed as they were of mere casual straylings from adjacent shores, produced upon his mind a very deep and lasting impression, whose traces one may without difficulty discern on every second page of the 'Origin of Species.'

On the last day of February, 1832, the 'Beagle' came to anchor in the harbour of Bahia, and young Darwin caught sight for the first time of the mutually strangling luxuriance of tropical vegetation. Nowhere on earth are the finest conditions of tropical life more fully realised than in the tangled depths of the great uncleared Brazilian forests, which everywhere gird round like a natural palisade with their impenetrable belt the narrow and laborious clearings of over-mastered man. The rich alluvial silt of mighty river systems, the immemorial manuring of the virgin soil, the fierce energy of an almost equatorial sun, and the universal presence of abundant water, combine to make life in that marvellous region unusually wealthy, varied, and crowded, so that the struggle for existence is there perhaps more directly visible to the seeing eye than in any other known portion of God's universe. 'Delight itself,' says Darwin in his journal, with that naive simplicity which everywhere forms the chief charm of his direct and unaffected literary style – 'delight itself 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.' In truth, among those huge buttressed trunks, overhung by the unbroken canopy of foliage on the vast spreading and interlacing branches, festooned with lianas and drooping lichens, or beautified by the pendent alien growth of perfumed orchids, Darwin's mind must indeed have found congenial food for apt reflection, and infinite opportunities for inference and induction. Prom the mere picturesque point of view, indeed, the naturalist enjoys such sights as this a thousand times more truly and profoundly than the mere casual unskilled observer: for it is a shallow, self-flattering mistake of vulgar and narrow minds to suppose that fuller knowledge and clearer insight can destroy or impair the beauty of beautiful objects – as who should imagine that a great painter appreciates the sunset less than a silly boy or a sentimental schoolgirl. As a matter of fact, the naturalist knows and admires a thousand exquisite points of detail in every flower and every insect which only he himself and the true artist can equally delight in. And a keen intellectual and æsthetic joy in the glorious fecundity and loveliness of nature was everywhere present to Darwin's mind. But, beyond and above even that, there was also the architectonic delight of the great organiser in the presence of a noble organised product: the peculiar pleasure felt only by the man in whose broader soul all minor details fall at once into their proper place, as component elements in one great consistent and harmonious whole – a sympathetic pleasure akin to that with which an architect views the interior of Ely and of Lincoln, or a musician listens to the linked harmonies of the 'Messiah' and the 'Creation.' The scheme of nature was now unfolding itself visibly and clearly before Charles Darwin's very eyes.

After eighteen memorable days spent with unceasing delight at Bahia, the 'Beagle' sailed again for Rio, where Darwin stopped for three months, to improve his acquaintance with the extraordinary wealth of the South American fauna and flora. Collecting insects was here his chief occupation, and it is interesting to note even at this early period how his attention was attracted by some of those strange alluring devices on the part of the males for charming their partners which afterwards formed the principal basis for his admirable theory of sexual selection, so fully developed in the 'Descent of Man.' 'Several times,' he says, 'when a pair [of butterflies], probably male and female, were chasing each other in an irregular course, they passed within a few yards of me; and I distinctly heard a clicking noise, similar to that produced by a toothed wheel passing under a spring catch.' In like manner he observed here the instincts of tropical ants, the habits of phosphorescent insects, and the horrid practice of that wasp-like creature, the sphex, which stuffs the clay cells of its larvæ full of half-dead spiders and writhing caterpillars, so stung with devilish avoidance of vital parts as to be left quite paralysed yet still alive, as future food for the developing

grubs. Cases like these helped naturally to shake the young biologist's primitive faith in the cheap and crude current theories of universal beneficence, and to introduce that wholesome sceptical reaction against received dogma which is the necessary ground-work and due preparation for all great progressive philosophical thinking.

In July they set sail again for Monte Video, where the important question of climate and vegetation began to interest young Darwin's mind. Uruguay is almost entirely treeless; and this curious phenomenon, in a comparatively moist sub-tropical plain-land, struck him as a remarkable anomaly, and set him speculating on its probable cause. Australia, he remembered, was far more arid, and yet its interior was everywhere covered by whole forests of quaint indigenous gum-trees. Could it be that there were no trees adapted to the climate? As yet, the true causes of geographical distribution had not clearly dawned upon Darwin's mind; but that a young man of twenty-three should seriously busy himself about such problems of ultimate causation at all is in itself a sufficiently pointed and remarkable phenomenon. It was here, too, that he first saw that curious animal, the Tucutuco, a true rodent with the habits of a mole, which is almost always found in a blind condition. With reference to this singular creature, there occurs in his journal one of those interesting anticipatory passages which show the rough workings of the distinctive evolutionary Darwinian concept in its earlier stages. 'Considering the strictly subterranean habits of the Tucutuco,' he writes, 'the blindness, though so common, cannot be a very serious evil; yet it appears strange that any animal should possess an organ frequently subject to be injured. Lamarck would have been delighted with this fact, had he known it, when speculating (probably with more truth than usual with him) on the gradually acquired blindness of the Aspalax, a gnawer living under the ground, and of the Proteus, a reptile living in dark caverns filled with water; in both of which animals the eye is in an almost rudimentary state, and is covered by a tendinous membrane and skin. In the common mole the eye is extraordinarily small but perfect, though many anatomists doubt whether it is connected with the true optic nerve; its vision must certainly be imperfect, though probably useful to the animal when it leaves its burrow. In the Tucutuco, which I believe never comes to the surface of the ground, the eye is rather larger, but often rendered blind and useless, though without apparently causing any inconvenience to the animal: no doubt Lamarck would have said that the Tucutuco is now passing into the state of the Aspalax and Proteus.' The passage is instructive both as showing that Darwin was already familiar with Lamarck's writings, and as pointing out the natural course of his own future development.

For the two years from her arrival at Monte Video, the 'Beagle' was employed in surveying the eastern coast of South America; and Darwin enjoyed unusual opportunities for studying the geology, the zoology, and the botany of the surrounding districts during all that period. It was a suggestive field indeed for the young naturalist. The curious relationship of the gigantic fossil armour-plated animals to the existing armadillo, of the huge megatherium to the modern sloths, and of the colossal ant-eaters to their degenerate descendants at the present day, formed one of the direct inciting causes to the special study which produced at last the 'Origin of Species.' In the Introduction to that immortal work Darwin wrote, some twenty-seven years later, 'When on board H.M.S. "Beagle" as naturalist, I was much struck with certain facts in the distribution of the organic beings inhabiting South America, and in the geological relations of the present to the past inhabitants of that continent. These facts, as will be seen in the latter chapters of this volume, seemed to throw some light on the origin of species – that mystery of mysteries, as it has been called by one of our greatest philosophers.' And in the body of the work itself he refers over and over again to numberless observations made by himself during this period of rapid psychological development – observations on the absence of recent geological formations along the lately upheaved South American coast; on the strange extinction of the horse in La Plata; on the affinities of the extinct and recent species; on the effect of minute individual peculiarities in preserving life under special circumstances; and on the influence of insects and blood-sucking bats in determining the existence

of the larger naturalised mammals in parts of Brazil and the Argentine Republic. It was the epoch of wide collection of facts, to be afterwards employed in brilliant generalisations: the materials for the 'Origin of Species' were being slowly accumulated in the numberless pigeon-holes of the Darwinian memory.

Among the facts thus industriously gathered by Darwin in the two years spent on the South American coast were several curious instincts of the cuckoo-like molothrus, of the owl of the Pampas, and of the American ostrich. A few sentences scattered here and there through this part of the 'Naturalist's Journal' may well be extracted in the present place as showing, better than any mere secondhand description could do, the slow germinating process of the 'Origin of Species.' In speaking of the toxodon, that strange extinct South American mammal, the young author remarks acutely that, though in size it equalled the elephant and the megatherium, the structure of its teeth shows it to be closely allied to the ruminants, while several other details link it to the pachyderms, and its aquatic peculiarities of ear and nostril approximate it rather to the manatee and the dugong. 'How wonderfully,' he says, 'are the different orders, at the present time so well separated, blended together in different points of the structure of the toxodon.' We now know that unspecialised ancestral forms always display this close union of peculiarities afterwards separately developed in distinct species of their later descendants.

Still more pregnant with evolutionism in the bud is the prophetic remark about a certain singular group of South American birds, 'This small family is one of those which, from its varied relations to other families, although at present offering only difficulties to the systematic naturalist, ultimately may assist in revealing the grand scheme, common to the present and past ages, on which organised beings have been created.' Of the agouti, once more, that true friend of the desert, Darwin notes that it does not now range as far south as Port St. Julian, though Wood in 1670 found it abundant there; and he asks suggestively, 'What cause can have altered, in a wide, uninhabited, and rarely visited country, the range of an animal like this?' Again, when speaking of the analogies between the extinct camel-like macrauchenia and the modern guanaco, as well as of those between the fossil and living species of South American rodents, he says, with even more prophetic insight, 'This wonderful relationship in the same continent between the dead and the living will, I do not doubt, hereafter throw more light on the appearance of organic beings on our earth, and their disappearance from it, than any other class of facts.' He was himself destined in another thirty years to prove the truth of his own vaticination.

Конец ознакомительного фрагмента.