Darwin and his Work.

By EDWARD B. AVELING, D.Sc., F.L.S.

PAPER I.

IT is given to but few men or women to possess genius, though the word is unfortunately far too freely used. Even if the well-known definition of genius as 'an immense faculty of taking pains' be regarded as exhaustive, the list of those possessing it, in the course of a century, would not be a very lengthy one. If we regard the definition given above as incomplete, and recognise that the word implies something more, something rarer than even indomitable perseverance, those worthy of the title are few indeed.

But it is given to most people to admire genius. Between these two classes, the intellectual giants and the large mass of folks of ordinary mental stature, is an intermediate class—the students. These are men and women in whose lives duty and inclination have happily combined to the one great end—the acquisition of knowledge. The students are intellectual middlemen. It is their duty, as it is their privilege, to receive great truths from those on the heights above them, and to transmit them to the multitudes toiling below. Thus is the great mass of mankind raised slowly but surely up the steep hill of knowledge towards a serener air.

Of the men of genius produced by England, few stand higher than Charles Darwin. In him the immense faculty of taking pains exists to the fullest. To this the extraordinary number of his recorded observations and experiments, the wide field over which they extend, the long list of new facts he has given us, bear witness. But he is something more than a mere observer or recorder of facts. He is not of those who regard as the chief end of science an ever lengthening list of species and varieties. There is something higher even than the collection of facts—that is, the making of generalizations from those facts. The object of the recordal of multitudinous small truths is the arrival at some one great truth. That is the true scientific mind which, never neglecting observation and experiment, yet is ever looking for the single generalization to be induced from the mass of details. Whether we look at the number of general truths enunciated by Darwin, or at the magnitude and importance of them, we are constrained to acknowledge that in this attribute of genius he has no rival.

It is my purpose, as one of the student class, to tell something of this man's work to those who have not time nor opportunity to investigate it fully for themselves. The most usual summing up of his labours, his writings, his very life, is: 'Darwin? Oh yes! Says we come from apes!' This epitome of his words and deeds is as unjust as it is summary; yet the large majority of even educated people have no other idea than this connected with the name of Darwin. It is necessary, therefore, to insist upon the fact, that, independently of his theories, the author of the *Origin of Species* has done more for the extension of our knowledge than perhaps any other man living; that two of the most carefully-elaborated biological subjects have been worked out by him; that in minuteness and accuracy of observation, as well as in wideness of generalization, Darwin stands first among the scientific men of England—I had almost written of the world.

Especially is it necessary that more of us should know the true meaning of the word evolution. In an age when, according to a distinguished authority, young ladies in gilded saloons prattle atheism about protoplasm, it is not wonderful that the word evolution should be on many lips. But the word to the general only connotes the development of man from some lower form of animal. The principle of evolution involves much more than that. If only to show to some readers more clearly what it does involve, and to impress upon them the fact that man's origin is comparatively of secondary importance, it were well, perhaps, that these articles should be written. Especially, therefore, will it be my aim to state clearly the full meaning of the theory of evolution now almost universally accepted by scientific thinkers, the arguments for and the arguments against that hypothesis.

The general plan of these papers will be as follows. The published works of Charles Darwin will be one by one recorded, analyzed, epitomized. Attention will be called to the chief discoveries noted, the chief theories broached in each. The books will not be taken exactly in their chronological order. The first to be considered will, however, be also the first in point of time. (1) *The Naturalist's Voyage round the World* will form, by its general treatment of scientific questions, an excellent introduction to the more special treatises that follow. (2) For some time Mr. Darwin seems to have paid especial attention to geology, and the works on *Coral Reefs*, on *Volcanic Islands*, and on *The Geology of South America* will next occupy our attention. (3) The series of observations on plants comprised in the volumes on *Climbing Plants*, *The Orchids*, *Insectivorous Plants*, and *Cross and Self-Fertilization*, will be noticed next. (4) An account of the one exhaustive treatise on a purely zoological subject, the *Monograph of the Cirripedia*, will follow. (5) Finally, the series of works bearing more immediately on the great question of evolution will be studied,—viz. *The Origin of Species*, *The Animals and Plants under Domestication*, *The Descent of Man*, *The Expression of the Emotions*.

It is earnestly hoped that this series of papers may be of use to students themselves. Even those who have read, and read carefully, the writings in question, may find the perusal of these articles of value to them, as they find the re-reading of their lecture notes of use as recalling the experiments and statements of their lecturer. There will be made for them that which, in truth, each should make for himself, a complete analysis of Darwin's works. It may be said that nothing is worth reading that is not worth analyzing. It may be said that no idea of another man's is ever in reality understood by the student, until it has been expressed in the student's own words. Surely, then, the writings of the man perhaps most worthy to be read at the present day, the writings of the man whose ideas are the most necessary to become ours, are worthy of analysis.

But, as was stated above, this series may be of value to the ordinary reader. As the translations of classical authors in *Bohn's Library* are read and studied by those unacquainted with the Latin and Greek tongues, as thus the great thoughts of the old-world thinkers are rendered intelligible to those unable to understand them in the originals, so is it thought that the many who have not the time or the technical skill required to read the whole of the great master's works, may yet become acquainted with some of their contained wonders and beauties by the perusal of these papers. It is well that all of us should know at least the outline of the work that has been done by the man; for as the name of Chaucer marks the 14th, and the name of Shakespeare the 16th century, so probably will the name of Charles Darwin mark this 19th century in the years to come.

cribing its arch, the aorta takes nearly
ne of the body, lying a little to the left
oral column, and giving off numerous
It is now known as the descending
arterial offshoots, dividing within the
ns, terminate in capillaries. These
vessels, reuniting, constitute the veins.
finally return the blood to the right
Mammalia there are one ascending
cending *vena cava*.—It will be remem-
irds and reptiles have two descending
The elephant and the Ornithorhyncus
angement similar to that met with in

Mirabilia.—Remarkable networks of
met with in certain individuals of this
s, in the carotids of most animals that
networks are seen. The vessels
its and nasal organs of herbivorous
present *retia mirabilia*. As these
eeding have to maintain the head in
position for a considerable length of
ility of such networks will be evident;
t the too rapid flow of blood to the
the limbs of the sloth occur similar
These are in relation to the curious
unusual position of this tree-haunting

uatic Mammalia special arrangements
in both the circulatory and respiratory
o enable the animals to remain some
water. In the circulatory apparatus
the form of arrangements to prevent
d passage of blood to the lungs whilst
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n the intercostal arteries, and expan-
course of the iliac veins, are the most
uctural arrangements for this purpose.
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the Sirenia.

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PAPER II.

A. THE NATURALIST'S VOYAGE ROUND THE WORLD.

ON the 27th of December 1831, a ten-gun brig, the *Beagle*, sailed from Devonport. The object of the expedition was to survey certain parts of South America, and to put a girdle round the earth in the shape of chronometrical measurement. On the 2d of October 1836 the *Beagle* made the coast of England once again. To the Englishman with the old love of battle not quite dead within him, the *Victory* and the *Arethusa* are historical names among ships; but to the student, far higher ranks the name of the ten-gun brig *Beagle*, for during that period of nearly five years the vessel was accompanied by Charles Darwin. *The Naturalist's Voyage round the World* is an account, in the form of a diary, of the most interesting facts that came under the observation of the writer during that time.

Among the memories of our boyhood, not the least vivid is the recollection of two quaint, long-haired men, who told us, in language of beautiful simplicity, two stories that never failed to fascinate. They are stories that will last as long as there are boys to read them. About their names hangs an indefinable charm, such as that which lies in the word 'home,' in the portrait of one long passed away, in the scent of a flower that one's mistress was wont to twine in her sunny hair. The names of these two writers are Daniel Defoe and John Bunyan. Next to *Robinson Crusoe* and the *Pilgrim's Progress*, I know of no book so likely to take firm hold of a boy's mind as *The Naturalist's Voyage round the World*.

The outcry against fairy tales for boys and girls should be left to Mr. Gradgrind. The rest of the world must confess to a passionate admiration for Jack the Giant-killer, a passionate adoration of Cinderella, and are never tired of hearing of gnomes and pixies and kelpies. On the other hand, the terrible outcry made by some good folks against giving facts to children is a little incomprehensible. It seems to be forgotten that to our little ones all they read and hear is true. Hop-o'-my-thumb, Friday, Mr. Greatheart, are real beings to them. They *know* that the wonderful beanstalk grew to that portentous height, they *know* that Cassim's bones are still lying in the robber's cave, they *know* that Aladdin's lamp is somewhere in the world if they could but find it. Let the children have the beautiful old fairy tales, but let them have, moreover, such books as that we are speaking of. They will learn for themselves, sufficiently soon, what is romance.

And, indeed, *The Naturalist's Voyage round the World* reads very much like a fairy tale. It takes us into wonderful regions where vampire bats flit through the night, where our path lies across beds of sensitive plants, and a broad track is left behind us, marked by the drooping of the tender leaf stalks, where peach trees are used for firewood, where hail falls that kills cattle, where showers of butterflies come like summer rain.

From the first page to the last, the book is crowded with facts as dazzling as any inventions of the most brilliant fancy. There is no special knowledge required to enjoy this most fascinating work. Its statements will, of course, have a deeper meaning to any one possessed of a little scientific lore; but some of the most enthusiastic admirers of the book are readers of the ordinary class, without the faintest suspicion of technical knowledge.

And yet Mr. Darwin's style can hardly be called a

not suffering from the pressure of a superimposed naturalist. A very powerful attachment to water is characteristic of these Chelonia, and near the springs are to be seen two sets of the reptiles—the one hastening with outstretched necks and longing aspirations towards their watery elysium; the other returning calm and composed, with all the complacent though somewhat irritating equanimity of satiety. In this way they tread out broad, well-beaten paths from the coast inland—paths which led to the first discovery of the watering-places by the Spaniards.

These beings live apparently to an exceedingly venerable age. Slow in living, they seem to be equally so in dying, generally terminating their years by a fall from a precipice or by some other accident. In connection with this same subject of death, a curious fact is recorded in relation to certain parasites on birds that reminds us forcibly of the half mythological tales of rats deserting a ship doomed to destruction. For several hours before a huge condor, one of the carrion fowl of America, died, the parasites upon it were seen crawling to the outside feathers.

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popular one. He is not an elegant writer. Some of his sentences, indeed, are at times almost clumsy, but the exquisite charm of the new series of facts he tells us atones for any peculiarities of style. We forget how he talks to us, we are so delighted with what he says. If he had written nothing else, this volume alone would have stamped its author as one of the first among contributors to general scientific knowledge.

Pre-eminently in this work shine out Mr. Darwin's extraordinary powers of observation. He seems well-nigh omniscient. Nothing escapes him. Dust in the air, colour in the sea, the habits of a spider, a cuttle-fish, an ostrich, an Indian, he notices all. But whilst this his first great work is specially a collection of facts, it is not that alone. Again and again are encountered instances of his capacity for abstracting from a large number of small truths the one great truth running through them all. In these pages the reader of riper mind will linger over many passages that the boys and girls will skip—passages embodying wide generalizations pregnant with interest. Especially will the student be impressed with the numerous occasions whereon he will meet hints and suggestions of the line of thought so fully worked out in later years in the *Origin of Species*. In this first publication are the germs at least of the views enunciated in the *Magnum Opus*.

It will be well to consider (1) the nature of the facts communicated to the world in *The Naturalist's Voyage;* (2) the nature of the chief generalizations contained in the volume. It is especially difficult to do this with such a writer as Mr. Darwin, but the attempt will be made.

(1) *An Account of some of the most important Facts contained in The Naturalist's Voyage round the World.*—On the 6th of December 1834, on the island of San Pedro, off the coast of Chili, were to be seen two English naval officers, engaged in taking a round of angles with a particular astronomical instrument known as the theodolite. Upon this island of San Pedro at that time resided a certain fox, who on the day and at the hour in question was indulging in his customary evening stroll. Beholding the strangers in the course of his peregrinations, the perambulating animal stopped and took a cautious survey of them. His curiosity was aroused. He grew deeply interested in these men performing such strange antics with such a queer-looking instrument. He became absorbed in contemplation. On the rocks behind him, a naturalist, ever on the look-out for new specimens, happened to be walking. *He* became absorbed in contemplation of the rare animal before him. The animal was curious in two senses of the word. The interest of the scientific fox took the passive form of close observation. The interest of the scientific man took the active form of cautious advancing. The former stood wrapt in wonder. The latter drew near and smote a deadly blow, with a geologist's hammer, on the head of the observing one. The name of the fox, whose remains are to be seen to this day, in the museum of the Zoological Society, was *Canis Fulvipes*. The name of the naturalist was Charles Darwin.

The earth is one great battle-field. Between the innumerable races of animals dwelling on the bosom of that which is the mother of them all, endless struggles occur. No mere skirmishes are these contests as a rule, but battles wherein death is the penalty of defeat. *Væ victis* is the cry of all nature. No matter of surprise, therefore, is it that in *The Naturalist's Voyage round the World* stories such as the above are not infrequent; no wonder is it that some of the most fascinating parts of the book are those wherein are recorded the life and death struggles of the animal creation. We read with deepest interest, whereunto something of horror lends a zest, of the weird, ghoul-like wasps that sting spiders or caterpillars not to death, but half way thereto; then store up their victims till such time as the wasp larvæ, emerging from the eggs, devour at their leisure the inert yet living bodies of their prey. We watch eagerly the fight between wasp and spider, the wounding of the latter, its temporary escape, the wondrous systematic hunt for it by its unrelenting foe, the discovery, and finally, after much artful manœuvring, the deadly stab that narcotizes the unfortunate Arachnid. It is with a pleased sense of that poetic justice so dear to us all, when it is dealt out to other people, that we read, on the other hand, of the terrible spider which wraps round and round the miserable wasp entangled in its web, a fatal mesh; then inflicting the death-bite, waits with a fearful patience till the poison has done its work, and the blood of the victim may be sucked from the lifeless corpse.

There are endless tales, moreover, in these pages for those who object even to an extreme extent to the element of horror. The very spider mentioned immediately above, when disturbed, has all kinds of various ways of saving itself from peril. How it runs from one side of its huge web through a central passage to the other; how it drops into the dense thicket beneath, often letting fall a fine rope previously, down which it lowers itself with marvellous rapidity; how, standing in the middle of the web, it jerks the gossamer circles backwards and forwards with such speed that, in the rapid vibration, the outline of the creature's body becomes indistinct and lost!

Amongst curious animals, tortoises again rank high. Some met with in Chatham Island weighed respectively more than fourteen stone. These huge monsters, suggestive of antediluvian beings, when encountered, usually fall to the ground as if dead, with a deep hiss and sudden and somewhat alarming disappearance of head and limbs. A few taps on their shells would reassure them, and, rising, they would march sedately onwards even with a man standing erect on their backs. Very sedate, in truth, are their movements. Some six yards per minute was all that could be accomplished by one of average speed, even when

not suffering from the pressure of a superimposed naturalist. A very powerful attachment to water is characteristic of these Chelonia, and near the springs are to be seen two sets of the reptiles—the one hastening with outstretched necks and longing aspirations towards their watery elysium; the other returning calm and composed, with all the complacent though somewhat irritating equanimity of satiety. In this way they tread out broad, well-beaten paths from the coast inland—paths which led to the first discovery of the watering-places by the Spaniards.

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