and some others, whom he should gladly have noticed more at length. Professor Balfour, however, had kindly prepared notices, which perhaps might now be read.

Lord NEAVES then read the notices of the Fellows who had died during the year. Of foreign Honorary members the Society had lost one—Baron Plana, of Turin. On their home list they had to lament the loss of ten of their ordinary Fellows, namely—Leonard Horner, Professor Miller, Robert Morrison, Dr Newbigging, Professor Pillans, Dr Archibald Robertson, Dr Smyttan, [illegible] Lieutenant-General Swinburne, Dr R. D. Thomson, and Lord Wood. [illegible] commencement of this Fellows of the Society at the commencement of this session was 279, a larger number than had been on their list for many years.

The Council of the Society reported that the Makdougall Brisbane Prize for the biennial period 1862-64 had been awarded to Mr John Denis Macdonald, R.N., F.R.S., surgeon to H.M.S. Icarus, for his zoological papers published in the Transactions of the Society during that period.

On the motion of Principal FORBES, of St Andrews, a vote of thanks was given to the Duke of Argyle for his interesting and able address, which was briefly acknowledged by his Grace.

Tea was then served to visitors and members in the new South Room.

THE POWER OF MOVEMENT IN PLANTS. By Charles Darwin, LL.D., F.R.S., assisted by Francis Darwin. With Illustrations. London: John Murray.

ALTHOUGH nearly half-a-century has elapsed since Charles Darwin made his mark as a man of science and a writer by the publication of "A Naturalist's Voyage Round the World"—a work which has served as a model for naturalist-travellers ever since—it is pleasing to find that the burden of seventy-one years has neither dimmed his eye for observation nor abated his literary strength. His greatest work, "The Origin of Species," has just reached its majority, and the event has been appropriately signalised by the publication of another of those contributions to the theory which even anti-Darwinians have come to welcome as solid additions to the stock of human knowledge. The story of the adaptation of means to ends, and of the endless contrivances abounding in the animal and vegetable kingdoms, which he has told so well, is as acceptable to the special creationist as to the evolutionist, both finding a use for it within the limits of their respective theories. The present work will, in this as in other respects, compare favourably with any of its numerous predecessors. The movements of plants are exceedingly diverse, both in direction and purpose. Roots move downwards, stems as a rule mount upwards; many climbing plants ascend their supports in a graceful spiral, others trail along the ground. Most plants bend towards the light, a few turn from it; some have their leaves shutting up at night and reopening in the morning, others shrivel together when touched. Most of those movements are tolerably familiar, and have been frequently investigated both in this country and on the Continent, but they have not hitherto been treated as a whole, nor has any one attempted, as Mr Darwin now does, to show that a substantial unity underlies this outward diversity. How, it may be asked, on the theory of evolution, did all those diversified movements for such different purposes first arise? The researches detailed in the present work have supplied Mr Darwin with an answer. If the growing point of the stem of a climbing plant such as the hop be watched, it will be seen to be gradually altering its position, so as to describe in the course of an hour or two a circle in the air, and this motion, known as circumnutation, goes on so long as the plant continues to grow. Mr Darwin has found that this revolving motion, which exists in an exaggerated form in climbing plants, is common to every growing part of every plant, although often on a small scale. From the tip of the highest twig to the extremity of the lowliest rootlet, every growing point in a plant is for ever "sweeping small ellipses or circles" so far as surrounding circumstances will allow of it. This is no mere inference on the part of the author, but the result of actual observation of the different growing parts of an immense variety of plants, made with the aid of an ingenious registering apparatus, the numerous diagrams with which the work is illustrated being for the most part magnified tracings of the circumnutating movements actually observed. So general a phenomenon as this can hardly be supposed to have been gained for any special purpose, and, therefore, Mr Darwin concludes that it follows, in some unknown way, from the manner in which vegetable tissues grow. To his mind, however, it is mainly important as supplying "a basis or groundwork for the acquirement, according to the requirements of the plant, of the most diversified movements." It is a sort of raw material ready to be drawn upon at all times for any beneficial development or modification, just as the tendency to vary which exists in all living things, and the origin of which is equally mysterious, has, according to the author's more famous theory, afforded a common starting point for the evolution of new species.

The work is chiefly devoted to a study of the various modifications of this primitive revolving motion, which the struggle for existence among plants has been instrumental in producing. Among the most marvellous of these are the so-called sleep movements of plants. The leaves of many plants belonging to widely separate groups fold together upwards, and in some cases downwards, like the shutting of an umbrella, in the evening, and expand again horizontally in the morning. The leaves thus avoid facing the zenith and thereby obtain not rest—for they are always moving—but warmth, their upper surfaces being in this way protected from the chilling effects of nocturnal radiation. Neither is this a mere inference, Mr Darwin having demonstrated the fact by forcibly keeping awake a certain number of sleep-taking leaves. These were fastened down in their usual diurnal wide-awake position and exposed at night to a clear cold sky, the result being that they suffered much more from frost than did those leaves which were allowed to assume their vertical sleeping position. In some plants the periodicity of this movement was seen to have become so far established, probably through inheritance, that the leaves opened and closed in the usual manner for some time after they had been relegated to total darkness; in others, however, the want of the proper degree of illumination by day prevented their going to sleep at night. That the various forms of so-called sleep movement are merely useful modifications of the original revolving motion, common to all plants, is fairly borne out by the consideration, among others, that sleep-taking leaves have no other movement than this, and therefore, if it be not the circumnutating movement, then the latter must be awanting, and this, as Mr Darwin's researches have shown, "would be a monstrous anomaly." Another very important class of movements, also the result, according to the author, of modified circumnutation, are those excited in plants by light. To plants which live chiefly by decomposing carbonic acid, light is all important, and Mr Darwin adduces abundant evidence of its marvellously attractive influence. Plants, with few exceptions, bend readily towards a lateral light, the few exceptions being uninfluenced by it simply because in their case its influence would be detrimental. One of these is the insectivorous plant *Drosera rotundifolia*, in which it is of more importance that the leaves be placed in the best position for catching insects than that they be turned towards the light. Another is that of twining plants, which, were they to be attracted strongly towards a side light, would suffer injury by being drawn away from their indispensable supports. Many experiments were made to test the degree of sensitiveness to light in plants, and with sufficiently astonishing results. A pot with seedlings of *Phalaris canariensis*, which had been raised in darkness, was placed in a completely darkened room, at a distance of 12 feet from a small lamp. At this distance the light was so obscure, that the seedlings themselves could not be seen, nor was any visible shadow cast by a pencil held upright on a white card, and yet after about seven hours' exposure the seedlings were all distinctly turned towards the lamp. They were thus acted on "by a difference in the illumination of their two sides which the human eye could not detect." In order to find how small a beam of light would thus act—a point which bears on light serving as a guide to the young plant in emerging from fissures in the ground—a pot with seedlings was covered over with a tin vessel having a hole in one of its sides of less than 1-20th of an inch in diameter, and the whole was placed in front of a paraffin lamp, when, after a time, the seedlings were found to be plainly bent towards the minute aperture in the box. This extreme sensitiveness was found to be more or less affected by a variety of influences. Thus plants kept in the daylight during the previous day and morning did not turn so soon towards an obscured side light as did those which had been kept in darkness. In this there is something analogous to that which occurs in the human eye, the retina of which, after exposure to a bright light, cannot for some time after perceive a dim one. The present work abounds in instances of such analogies between plants and and animals; thus, as sensitiveness to light in animals is localised in the eye, so in many plants it is confined to the tips of certain parts, from which an influence is transmitted to the upper parts that causes them to bend. In such cases, it is only necessary to place a [illegible] to prevent the remainder [illegible] towards the light. The ever [illegible]

gravitation is another powerful [illegible] ments in plants, and these also Mr Dar[illegible] as merely forms of modified circumnutation. Plant movements excited by gravitation are [illegible] subterranean, and probably the most [illegible] interesting part of the book to non-[illegible] that in which he describes the [illegible] influences which direct the movements of roots, and the remarkable powers with which the tips of these organs are endowed. If the root of a seedling be placed horizontally on the ground, the tip, in obedience to gravitation, will turn downwards, and transmit an influence which will cause the adjoining parts to do likewise. If the tip, however, be amputated before the root is thus placed, the latter continues to grow, but this downward tendency is arrested and remains in abeyance till the growth of a new tip starts it afresh. It is a still more remarkable fact that if the tip be not removed until the root has lain for some time in the horizontal position, an influence is in the meantime transmitted from the tip to the upper parts, which continue to act after amputation. "To see anything like the above in the animal kingdom," says Darwin, "we should have to suppose that an animal, while lying down, determined to rise up in some particular direction, and that after its head had been cut off an impulse continued to travel very slowly along the nerves to the proper muscles, so that after several hours the headless animal rose up in the predetermined direction." It is the tip also which discriminates between a slightly harder and a softer object, and which thus guides the root along the lines of least resistance in the soil, the tip it is also which alone is sensitive to moisture, and which therefore guides the whole organ towards it. The reader of Mr Darwin's observations on this point will agree with him that it is hardly an exaggeration to say "that the tip of the radicle thus endowed, and having the power of directing the movements of the adjoining parts, acts like the brain of one of the lower animals." The work is brimful of interesting observations, carefully verified, and as such will be acceptable to all naturalists, while to the evolutionist it will be additionally welcome as supplying another link in the long chain of circumstantial evidence by which he seeks to put the truth of this doctrine beyond all controversy. It ought to be stated that in the carrying out of the extensive series of experiments of which the present work is largely a chronicle, as well as in the preparation of the work itself, Mr Darwin has had the assistance of his son, Mr Francis Darwin, whose independent biological researches have already given promise of future distinction in the field with which the name of Darwin will ever be associated.

Scotsman

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