

"Emerged from Maynooth College, with every prejudice of his boyhood strengthened, profoundly ignorant of the world or its political systems, regarding the Church as the divine source of all human power, and himself as the repository of no small portion of her infallibility."

Between the gentry of the parish and him,—

"There is not one idea in common in the entire range of metaphysical and material subjects. From the glory of heaven to outdoor relief they look at the question from opposite stand-points."

Still,—

"Hating and fearing Socialism as does Father Morrissey, the propositions embodied in the land agitation of 1879 are diametrically opposed to his principles, and when the agitation began he refused to sanction by his presence its immoral doctrines. But an appeal to a people's cupidity aroused feelings too deep to be restrained by the priests, so now Father Morrissey's voice is heard on many platforms, and once more he resumes his ascendancy, and leads his parishioners as a horse leads the driver who cracks a whip behind him."

We have not space to quote further, but we specially commend to our readers the sketch entitled, "The Country's Difficulty." In it the author touches with a more earnest hand some of that deeper Irish feeling, in which are elements of a conservative stability that if wisely assisted may possibly outlast the conventions of more civilised communities. The most cynical of these portraits should indeed rouse our compassion for so unshepherded a nation, and make us wish that a purer, even if sterner, justice might prevail, and that a higher standard of government should obtain, in the lowest as in the highest offices that have to do with Irish administration. On the whole, these sketches increase our belief that the power of the landowners must be restrained within narrower limits, while more self-respect will be ensured for the peasants if their tenures can be made more stable. But the stability that could be really beneficial must be attained by the working of national economy, rather than by any confiscatory legislation. If there should be a large increase of peasant-proprietors, and that subdivision, famine, and outrages among themselves should be the result, Irishmen are no fools, and will know that the peasants are themselves to blame. As the greatest of Irish politicians declared shortly before the Union, the reckless and idle indifference, the love of trade ventures rather than of labour, the faults that make of Ireland what she is, are immediately "traceable to that ill policy which kept landed property so long on one set of hands. Confine a man," says Burke, "to momentary possession, and you at once cut off that laudable avarice which every wise State has cherished, as one of the first principles of its greatness. Allow a man but a temporary possession, lay it down as a maxim that he never can have any other, and you immediately and infallibly turn him to temporary enjoyments; and these enjoyments are never the pleasures of labour and free industry, whose quality it is to furnish the present hours, and squander all upon prospect and futurity. They are, on the contrary, those of a thoughtless, loitering, and dissipated life. The people must be inevitably disposed to such pernicious habits merely from the short duration of their tenure which the law has allowed."

Looking at these "pictures of Ireland" by the light of Burke's warning, we can but be surprised that the Irish people are not all like those described by Terence M'Grath. We recall with a renewed esteem our memories of the devoted parish priests, the generous landlords who stood by their tenants in evil times, and the virtues of many a poor household, possessed of more true decency than broadcloth and mahogany furniture can bestow; we remember the unrecorded martyrdoms, the spiritual intelligence and the faithfulness of the people to the standard which appears to them the true one, and we are hopeful of their future, when this "tyranny shall be overpast."

We are bold to say that however puzzled Irish peasants may be by the apparent success of the agrarian revolt, however misled they may be by chimerical schemes and promises of a Parnell millennium, the Irish conscience is not as rotten to the core as this volume of pictures would suggest. It will tax the highest statesmanship to take the "leap in the dark" which seems inevitable next Session, but if it be in the direction of unfaltering justice and morality, it will best satisfy the mass of the Irish people.

#### THE MOVEMENTS OF PLANTS.\*

BESIDES those works with which in the popular estimation his name is more intimately associated, Mr. Darwin has claims on

the regard of the specialist of which it is almost impossible to over-estimate the importance. Leaving to the zoologist and geologist his work on Coral Islands, and monographs on the *Cirripedia*, and various fossil groups, the botanist claims the great naturalist as his own on the grounds of a series of physiological memoirs, which, while they undoubtedly do serve to illustrate and emphasise the hypothesis known by his name, yet appeal with equal success to the anti-Darwinian. The most uncompromising opponent of Darwin's brilliant synthesis cannot fail to appreciate his patient, but no less brilliant, analysis. The theory based on his results may be rejected, or be modified with the lapse of time and advance of knowledge, but the results themselves hold good. In a high degree this is the case with the series of works of which this on the *Power of Movement in Plants* is the most recent. Each volume is crowded with experimental evidence, given with the scrupulous care which is a special characteristic of our foremost English naturalist. The qualities impressed upon those researches whereby he revolutionised the study of biological science are met with in all his handiwork, and add to his writings this further value, in that they serve as perfect models for the younger student to follow. If England is to build up a school of botanical philosophy like to those which are possessed by France and Germany, and which ought to be possessed by the country of Ray, of Grew, Hales, Andrew Knight, and Robert Brown, it will be through the careful study by our younger botanists of the method followed by such a master as Mr. Darwin.

Fifteen years ago, the "Journal" of the Linnean Society contained a series of papers (afterwards republished), in which were brought together and most beautifully described a mass of experiments bearing on the movements and habits of climbing plants. They consist of an examination into the nature of certain movements, general or local, which have for their object the placing in a suitable position of a plant which is structurally too weak to support itself. Of such a nature are the climbing of an entire plant by the twining of its stem, and the carrying out of the same object by means of specialised organs called tendrils, or of morphologically normal organs which are, like the leaf-stalks of the *Clematis*, functionally tendrils. Many of these movements had been recognised, with more or less accuracy, from early times; but to Mr. Darwin belonged the credit of analysing their nature, and to a certain extent explaining their cause. The present work may be looked upon as a continuation and amplification of the sameline of research, and in it the phenomena are in some respects more remarkable than any with which the author has hitherto dealt. Mr. Darwin has a habit of educing remarkable results. Some of his books might almost lay claim to be ranked as romances, and their author accused of sensationalism, were it not that every stage in the process whereby the perhaps unanticipated goal is attained is clearly and carefully described and copiously illustrated; while the style is easy, and the language sufficiently untechnical not to place unnecessary difficulty in the way even of the "lay" reader.

In twining plants, Mr. Darwin found that the apex of the stem, with a few of the youngest internodes, leans over to one side in a continually varying position. Now, the end hangs over toward the north, then gradually more and more easterly till it bends towards the east, then to the south, then west, till finally it bends toward the north again, having in a space of time often as short as a few hours performed a complete circle of sometimes considerable size. In its pure form, this "revolving nutation," as it was called, is unaccompanied by any torsion or twisting of the axis. That side of the nutating stem which faces the north, faces the north throughout the movement.

In the present work, Mr. Darwin proceeds to show that revolving nutation, or "circumnutation," as he now proposes to call it, is not by any means confined to the cases which he dealt with in the *Movements and Habits of Climbing Plants*. On the contrary, it is met with in a more or less modified form in all young and some mature organs; that all the varied movements known to modern science, such as the sleep of leaves, the opening and closing of flowers, &c., are associated with it; that besides these evident cases, many organs, such as rootlets, where its existence would hardly be suspected, are endowed with it; and, indeed, that the position which every part of a plant assumes, whether in its young or fully-grown state, is the resultant of its movements of circumnutation, modified more or less profoundly by external causes. Mr.

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Darwin shows that when young, every part of a plant is in constant motion, the movement being usually not in a true circle (or rather, circular-spiral), but in the form of a more or less narrow ellipse, the long axes of the successive figures not being continually in the same direction, but intersecting each other at various angles. To take a hypothetical case, assuming that the organ is leaning over so as to point to the east, it gradually alters its position, so that in a short time it is directed to the west; it does not, however, in doing so pursue a rectilinear course (when projected upon a plane), but a more or less pronounced curve by the south; it then returns to the east, but by a line curved to the north. According to the definition of the curvature follows the degree of narrowness of the resulting ellipse. With stems, as we have seen above, the figure may simulate a true circle; while with leaves it is usually very narrow, often approaching the straight line. This is the movement reduced to its simplest form, but as a rule it is more complex, for the apex, while pursuing this general course, goes out of its way, as it were, to travel in a zigzag, or produces small secondary loops, which may disguise the shape of the ellipse. The very numerous diagrams of movement given in the book show clearly enough that there is, however, always one general direction which predominates. Just as in speaking of the shape of a leaf, the lesser lobation or serration can be disregarded, so in judging of the movements of the parts of plants, such minor eccentricities can be overlooked. As for the cause of the movement, it was at one time the custom to ascribe it to increased growth in varying positions, but it now appears probable that the motion has more to do with the varying degree of turgidity in the plastic cells of which the young growing part is built up.

The volume commences with an account of the movements of the different parts of the seedling plant, and it is in these earlier chapters that the most wonderful and unexpected results are recorded. The movement commences even before the seedling has appeared above the surface of the ground. The radicle, or primary rootlet, the first part of the plant to be developed, is the first to manifest movement. This it does from the moment it is protruded from the seed-coat. Through the sensitiveness of its tip, it bends downwards (geotropism); during its elongation it continually bends to and fro, and thus, by displacing the particles of earth, its penetration is rendered more easy; and having once penetrated the soil, it is fixed, it may be by the root-hairs, or by some special and occasionally striking contrivance, and thus a "purchase" is obtained which materially assists the further penetration of the rootlet. The tip of the radicle then, like the thin end of a wedge, pierces between the particles of earth, always with its circumnutating power ready to be manifested if, from any cause, the pressure on its sides is removed. Thus it will pass rapidly through a friable soil, and, if it finds a fissure, such as a worm-burrow, it can readily avail itself of it. At the same time, as Mr. Darwin shows by numerous experiments, the tip is sensitive to the smallest differential pressure (e.g., one two-hundredth of a grain), turning away at once from the most pressed side, and will, therefore, bend from any obstacle, and, as the author pointedly puts it, "thus follow with unerring skill a line of least resistance." As Sachs had previously shown in general terms, the radicle is sensitive to the direction of moist air, and this sensitiveness also Darwin shows to reside in the tip; but, unlike the irritation of pressure or injury, moisture causes a deflection towards its source,—a happy provision, which gives rise to what one feels tempted to call an *instinctive* power of seeking the dampest parts of the soil. The functions thus resident in the tip of the radicle may be fairly described as wonderful, this brief sketch only referring to a few of their most noticeable manifestations. The tip, in this way determining the course of the root, also transmits its sensations to the neighbouring parts; so that, with characteristic boldness, Mr. Darwin compares it to the brain of one of the lower animals, "receiving impressions from the sense-organs, and directing the several movements."

More readily noticeable are the properties of the stem portion of the seedling plant. Almost invariably it breaks through the surface of the soil in the form of an arch, while in its case also there is a tendency to circumnutate, kept in check by the pressure of the soil until after its appearance above the surface of the ground. The faintest ray of light acting strongly upon it, and in a manner the reverse of its action on a root, will direct the young stem along any chance fissure in the surface of the

soil, or, if the plant be already somewhat grown, through vegetation amongst which it may be hidden. The plant now develops organs of various kinds, endowed with various degrees of movement, while the external forces which are acting upon them act in different ways and to varying extent. With these generalised or localised movements, of the nature of what Mr. Darwin calls "modified circumnutations," the author deals in the second part of the volume. Here we meet with many old friends, such, for example, as the sensitive plant (*Mimosa pudica*), which to the botanist occupies almost the same position as the frog to the animal physiologist. The various phenomena of climbing and sleep, and the different actions of light and gravity, are here treated of in full. The author shows that, while growing, every part of the plant, "each shoot, petiole, sub-petiole, and leaflet is constantly describing small ellipses," and the clearly visible movements of many organs are only an exaggeration or modification of their primitive circumnutations, directed to some special end. While reading these chapters, one feels that here at last is the true poetry of motion, and that another world of active life has been included within the ever-receding horizon of human knowledge.

The volume is copiously illustrated, chiefly with diagrams of movement. Owing to the process of drawing adopted, these diagrams do not represent the exact nature and amount of the movement of the part. They serve only, as the author reminds us, to show that the part has moved, and in what general manner. It would have been acceptable if, in some few representative cases, the exact character of the movement could have been represented diagrammatically by a projection. In the diagrams, as they stand, the greater the obliquity of the movement the greater the distortion of the representative figure. In examining them, in order to get an idea of the actual extent and character of the movement, the reader has to go through much the same sort of mental process that would be necessary to enable him to recognise his own features, when viewed as reflected from the back of the bowl of a table-spoon.

It is a constant complaint that modern scientific work is almost entirely destructive, but with Mr. Darwin destruction and construction go hand-in-hand. While none more than he has laboured strenuously to break down the barriers of ignorance and prejudice which, like the "Sea of Ancient Ice," fence around the still unconquered pole of the biologist, with equal zeal has he laboured to build up clearer and, we would fain say, truer conceptions of what, in its diverse manifestations, life is. Whether we look upon his works as models of legitimate deduction, or merely as marvellous storehouses of facts, their value is the same. And equally in laborious accumulation of detail, in lucid exposition of fact, in cogent deduction, and in candid impartiality, the future historian of vegetable physiology will reckon *The Power of Movement in Plants* as the foremost of Mr. Darwin's botanical works.

#### THE DUKE OF ARGYLL ON NATURE AND THE SUPERNATURAL.\*

THE essay which the Duke of Argyll has contributed to the January number of the *Contemporary Review*, under the somewhat misleading title of "The Truthfulness of Human Knowledge," will be generally felt, we believe, to be the most interesting of his present series. We hasten to declare the title out of harmony, in our opinion, with the substance of the article, because it appears to us to suggest, quite untruly, a kind of discussion which would have very little value, and thus to deaden the reader's interest in what is well worthy of it. Before we can discuss the truthfulness of human knowledge, we must have some other kind of knowledge to compare it with, some independent acquaintance with the subject-matter of human knowledge by which we might test its value. We can provide no guarantee for the trustworthiness of the faculties which are all we have to work with. As Dr. Newman says, we do not so much trust as use them. Moreover, it does not appear to us that *knowledge* is the appropriate word for the faculty which the Duke means to defend. The ordinary use of language would surely keep that name for men's unquestioned beliefs, those at least on which there is a consensus of opinion among all educated persons. We cannot but regret that he did not confine himself to the profoundly luminous suggestion as to the *limitation* of human knowledge which we lately noticed (a suggestion we feel much strengthened by the present

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"Hating and fearing Socialism, as does Father Mortimer, the propositions embodied in the legislation of 1879 are diametrically opposed to his principles, and when the agitation began he refused to sanction by his presence the industrial doctrines. But an appeal to a people's existing sacred feelings too deep to be contained by the priests, as now Father Mortimer's voice is heard on many platforms, and once more to rouse his audacity, and lead his parishioners as a horse leads the driver who sits in a whip behind him."

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In the present work, Mr. Darwin proceeds to show that revolving rotation, or "circumrotation," as he now proposes to call it, is not by any means confined to the class which he dealt with in the *Movements and Habits of Climbing Plants*. On the contrary, it is met with in a more or less modified form in all young and some mature organs; that all the varied movements known to modern science, such as the sleep of leaves, the opening and closing of flowers, &c., are associated with it; that besides these evident cases, many organs, such as roots, where its existence would hardly be suspected, are endowed with it; and, indeed, that the position which every part of a plant assumes, whether in the young or fully-grown state, is the resultant of its movements of circumrotation, modified more or less probably by external causes. Mr.

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