SCIENCE.

The Power of Movement in Plants. By Charles Darwin, LL.D., F.R.S. Assisted by Francis Darwin. With Illustrations. (Murray.)

The sum and substance of this book, which, like all of Mr. Darwin's, contains a great mass of facts and generalisations, is *circumnutation*; all the various movements of different parts of plants being modifications of that phenomenon. This word stands for a circularly bowing motion of an organ, by which it describes irregular ellipses, loops, or zigzags, as it is successively directed towards all points of the compass. The cause is an increased turgescence on the convex side of the organ, which precedes growth, and which is then followed by a similar turgescence on the other side. If there be a *pulvinus*, which consists of an aggregation of small cells arrested in their development, then the increased turgescence of the cells on opposite sides is not followed by growth, and the organ can consequently circumnutate for much longer periods. "On the whole," Mr. Darwin says, "we may at present conclude that increased growth, first on one side and then on another, is a secondary effect, and that the increased turgescence of the cells, together with the extensibility of their walls, is the primary cause of the movement of circumnutation" (pp. 2, 3).

The work contains mines of wealth of observations on circumnutation, based on the most minute and careful experiments upon the movements of radicles, "hypocotyls" and "epicotyls" of seedlings; also upon flower-stems, stolons, and leaves; the "hypnotropic" or sleeping states of leaves being also brought about by modified circumnutation. The motions of climbing plants, and the influences of light, gravity, and other *stimuli*, are fully discussed in their bearings upon the subject.

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The author then describes how the arched "hypocotyls" (an abbreviation for "hypocotyledonary axes") and "epicotyls," or developing plumules, rise up and break through the soil by means of their circumnutation, assisted by apogeotropism—that is, as far as the resisting medium will allow of it. The cotyledons are also in constant motion, rising once up and once down in the course of twenty-four hours in a vertical plane. Some cotyledons, like leaves, are provided with a pulvinus, and Mr. Darwin finds that the difference between the movements induced by the aid of pulvini and without such aid is due to the expansion of the cells not being followed by growth in the first case and being so followed in the latter. The tissues of the pulvinus are arrested, and, consequently, the movements of pulvinated cotyledons last much longer than of those without a pulvinus. Cotyledons are affected "paratonically" by light—that is, their daily periodic movements are greatly and quickly disturbed by changes in its intensity or by its absence, showing that their movements are not governed by the actual amount, but by changes in the intensity or degree of light. Mr. Darwin next deals with the sensitiveness of the apex of the radicle to contact of solid bodies or to other irritants. An object which yields with the greatest ease will deflect a radicle. That of a bean encountering the polished surface of extremely thin tin-foil laid on soft sand made no impression on it, but yet was deflected at right angles; while the curvature of the upper part extended for a length of 8 to 10 mm. The results of Mr. Darwin's experiments were that the apex was sensitive to contact, and that an effect was transmitted to the upper part of the radicle, which was thus excited to bend away from the touching object. Sachs discovered that the radicle, a little above the apex, is sensitive, and bends like a tendril *towards* a touching object. But when one side of the *apex* is pressed by any object the growing part bends *away* from the object, and this, Mr. Darwin observes, seems to be a beautiful adaptation for avoiding obstacles in the soil. This, too, appears to be the only known instance of an organ bending away from an object in contact with it.

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GEORGE HE

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work by which he is perhaps best k
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cost twelve years' labour; all the ill
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feather of each bird, having been co
hand. To open the book at random
upon such an illustration as that of
cineraceus (Montagu's harrier) stand
mole, which puts up one forepaw as if to
further injury, would alone show the
and artistic taste of this accomplished o
gist. These great works, which might
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In giving an outline of the proofs that our printed English version was not Mandeville's, I was forestalling much of the interest of my intended edition of that version for the purpose of giving immediate information to students of English literature. Messrs. Thomas Arnold, Collier, and Minto (how many more I know not) have resolved to frustrate such Quixotic self-sacrifice, and have continued in their respective manuals to hold up "the father of English prose" on the throne into which he has been wrongfully forced. I am much touched by their generosity, and only hope that the students aforesaid will appreciate it equally.

People ask me when ever my edition *is* coming out. I have not an idea—but the delay is no fault of mine. In 1877 I learnt from the French Société de l'Orient Latin that they had in hand an elaborate critical text of the original French, which was to have appeared in the autumn of that year, but has been unavoidably deferred. I am bound to wait for this before I begin collating a critical text of both or either of the two English translations.

Edward B. Nicholson.

"Iazza."

Park Lodge, Weston-super-Mare: Feb. 7, 1881.

The first campaign of Thothmes III. was caused by a revolt across the eastern frontier, "beginning with Izza" (Brugsch, *Hist.*, Eng. tr., i. 320) or rather Iazza (Maspero, Pap. Abbott, 33), evidently the nearest point to Egypt.

When Esarhaddon began to feel his way toward Egypt "he took the city of Azza, which was situated on the small stream called the river of Egypt, dividing that country from Palestine" (G. Smith, *Assyria*, 130; Budge's *Esarhaddon*, iv. 41).

This Azza seems to be the Iazza of Thothmes. Is Wady el *Arîsh* a corruption of this name of Azza? Or is the "Neby *Jasar*" which Mr. Greville Chester mentions (Palestine Exploration Fund *Quarterly Statement*, 1880, p. 158) close to the sea-shore, at the entrance of the Wady, with the remains of ancient houses hard by, the representative of Iazza?

I think we have here a very interesting identification. Henry George Tomkins.

Kock's "Greek Comic Fragments."

Dublin: Feb. 8, 1881.

In my notice of Th. Kock's *Comicorum Atticorum Fragmenta*, vol. i., printed in No. 449 of the Academy, there are some points which require correction.

I have hardly been fair to Dr. Kock in placing his statement of the *arguments* on a level with that of Meineke. There are many cases where he has emended and improved upon (or even refuted) his predecessor. So, also, in adding new fragments, he has done more than I had stated, and in some cases, such as the Ὀλκάδες and Δράματα, he has found from his own reading several which had escaped all previous editors. I owe to a kindly letter from him the additional remark that the immense number of passages from Athenaeus discussed by Cobet in his *Novae* and *Variae Lectiones* do not show any remarkable profit obtained from his collation of the Codex A, so that the present editor of the Fragments did not consider its aid in any way indispensable.

It gives me much pleasure to be able to add these corrections within reasonable limits of time, while the book is still new and before many of your readers. I will only add that a longer and more minute study of it, in comparison with Meineke's edition, shows me how much has been added to our knowledge of the subject, not only by the intermediate studies of the Germans, but by the learning and acuteness of the new editor. There can be no doubt that his work, when completed, will take its place (as I before said) among the standard books in Greek philology. J. P. Mahaffy.

Appointments for Next Week.

Monday, Feb. 14, 3 p.m. Royal Institution: "The Troubadours," by Mr. F. Hueffer.
5 p.m. London Institution: "Fruits and Seeds," by Sir John Lubbock.
8 p.m. Royal Academy: "The Study and Practice of Architecture," by Mr. G. E. Street.
8 p.m. Society of Arts: "Watchmaking," II., by Mr. E. Rigg.
8 p.m. Aristotelian: "Berkeley," by Mr. W. C. Barlow.
8.30 p.m. Geographical: "Geographical and Physical Aspects of Sarawak and North Borneo," by Mr. W. M. Crocker.

Tuesday, Feb. 15, 3 p.m. Royal Institution: "The Blood," by Prof. Schäfer.
7.45 p.m. Statistical.
8 p.m. Civil Engineers: Discussion on "The Portsmouth Dockyard Extension Works."
8 p.m. Spelling Reform Association: "Sound and Unsound Spellers," by Mr. H. B. Wheatley.
8.30 p.m. Zoological: "On Additions to the Society's Menagerie during January 1881," by the Secretary; "On the Coleopterous Insects belonging to the Family *Hispidae* collected by Mr. Buckley in Ecuador," by Mr. C. O. Waterhouse; "Additions to the Rhyncotal Fauna of the Ethiopian Region," by Mr. W. L. Distant; "On a Collection of Shells from Lakes Tanganyika and Nyassa, &c.," by Mr. Edgar A. Smith.

Wednesday, Feb. 16, 8 p.m. Society of Arts: "Participation of Labour in the Profits of Enterprise," by Mr. Sedley Taylor.
8 p.m. British Archaeological Association: "Prehistorio Interment at Plymouth," by Mr. F. Brent; "Roman Wall of London in Houndsditch," by Mr. C. Watkins; "Notes on New Grange," by Mr. J. Romilly Allen.

Thursday, Feb. 17, 3 p.m. Royal Institution: "Drawing-room Music," by Prof. Pauer.
4.30 p.m. Royal.
7 p.m. Numismatic.
7 p.m. London Institution: "Violins," by the Rev. H. R. Haweis.
8 p.m. Royal Academy: "The Principles of Architecture," by Mr. G. E. Street.
8 p.m. Linnean: "British Fishes," by Dr. P. Day; "On Right- and Left-hand Contortion of the Corolla," by Mr. C. B. Clarke; "On a New Form of Sponge," by Prof. P. M. Duncan; "On the Reparative Processes which occur in Vegetable Tissues," by Mr. S. G. Shattock.
8 p.m. Chemical.
8.30 p.m. Antiquaries.

Friday, Feb. 17, 8 p.m. Geological: Anniversary.
8 p.m. Philological: "On the Pronunciation, Grammar, and Non-Literary Vocabulary of Welsh; with Collections of Dialogues, Proverbs, &c.," II., by H. Sweet.
9 p.m. Royal Institution: "Fruits and Seeds," by Sir John Lubbock.

Saturday, Feb. 19, 3 p.m. Royal Institution: "Ancient Egypt," by Mr. R. S. Poole.

SCIENCE.

The Power of Movement in Plants. By Charles Darwin, LL.D., F.R.S. Assisted by Francis Darwin. With Illustrations. (Murray.)

The sum and substance of this book, which, like all of Mr. Darwin's, contains a great mass of facts and generalisations, is *circumnutation*; all the various movements of different parts of plants being modifications of that phenomenon. This word stands for a circularly bowing motion of an organ, by which it describes irregular ellipses, loops, or zigzags, as it is successively directed towards all points of the compass. The cause is an increased turgescence on the convex side of the organ, which precedes growth, and which is then followed by a similar turgescence on the other side. If there be a *pulvinus*, which consists of an aggregation of small cells arrested in their development, then the increased turgescence of the cells on opposite sides is not followed by growth, and the organ can consequently circumnutate for much longer periods. "On the whole," Mr. Darwin says, "we may at present conclude that increased growth, first on one side and then on another, is a secondary effect, and that the increased turgescence of the cells, together with the extensibility of their walls, is the primary cause of the movement of circumnutation" (pp. 2, 3).

The work contains mines of wealth of observations on circumnutation, based on the most minute and careful experiments upon the movements of radicles, "hypocotyls" and "epicotyls" of seedlings; also upon flower-stems, stolons, and leaves; the "hypnotropic" or sleeping states of leaves being also brought about by modified circumnutation. The motions of climbing plants, and the influences of light, gravity, and other *stimuli*, are fully discussed in their bearings upon the subject.

Commencing with radicles, we learn that, as soon as the tip has protruded from a seed, it begins to circumnutate, the use apparently being to aid it in penetrating the soil, by guiding it along the lines of least resistance, and especially into cracks, worm-burrows, &c. Mr. Darwin observes that "geotropism," which is a weak force, does not give a radicle sufficient power to penetrate the ground, but merely tells it which course to pursue. The actual penetration is due to the forces of longitudinal and transverse growth. An ingenious contrivance for growing radicles in circular holes cut in split pieces of wood or in wooden clips connected by a spring showed that the force exerted in the first case, as a transverse strain, was probably more than 8 lbs. 8 oz., and in the latter case 3 lbs. 4 oz.; while the apex increased in length with a force equal to at least a quarter of a pound. I would venture to suggest a possible source of error in the experiment with the pincers, for they only show the least amount of force requisite to open them to a stated distance. There is nothing to show that, if the spring of the clip had been three times greater than it was, the radicle could not have just as easily opened them to the same distance, for it might have possessed, and probably did possess, much greater transverse power; but, *the diameter of the radicle at any point not increasing beyond the requirements of growth*, it could not possibly widen the clips to the full extent of the power possessed. The result of these forces is that the radicle acts like a powerful wedge driven slowly into a crevice and expanding simultaneously.

The author then describes how the arched "hypocotyls" (an abbreviation for "hypocotyledonary axes") and "epicotyls," or developing plumules, rise up and break through the soil by means of their circumnutation, assisted by apogeotropism—that is, as far as the resisting medium will allow of it. The cotyledons are also in constant motion, rising once up and once down in the course of twenty-four hours in a vertical plane. Some cotyledons, like leaves, are provided with a pulvinus, and Mr. Darwin finds that the difference between the movements induced by the aid of pulvini and without such aid is due to the expansion of the cells not being followed by growth in the first case and being so followed in the latter. The tissues of the pulvinus are arrested, and, consequently, the movements of pulvinated cotyledons last much longer than of those without a pulvinus. Cotyledons are affected "paratonically" by light—that is, their daily periodic movements are greatly and quickly disturbed by changes in its intensity or by its absence, showing that their movements are not governed by the actual amount, but by changes in the intensity or degree of

light. Mr. Darwin next deals with the sensitiveness of the apex of the radicle to contact of solid bodies or to other irritants. An object which yields with the greatest ease will deflect a radicle. That of a bean encountering the polished surface of extremely thin tin-foil laid on soft sand made no impression on it, but yet was deflected at right angles; while the curvature of the upper part extended for a length of 8 to 10 mm. The results of Mr. Darwin's experiments were that the apex was sensitive to contact, and that an effect was transmitted to the upper part of the radicle, which was thus excited to bend away from the touching object. Sachs discovered that the radicle, a little above the apex, is sensitive, and bends like a tendril *towards* a touching object. But when one side of the *apex* is pressed by any object the growing part bends *away* from the object, and this, Mr. Darwin observes, seems to be a beautiful adaptation for avoiding obstacles in the soil. This, too, appears to be the only known instance of an organ bending away from an object in contact with it.

An exquisite series of experiments was made by affixing cards, thin glass, &c., to the tips of radicles, which consequently curved away towards the opposite side—in some cases to such an extent as to make complete hoops or even knots! The motion is affected by different degrees of temperature; and so small a force as the two-hundredth part of a grain sufficed to excite movements in some radicles of the bean. Radicles are also sensitive to prolonged irritation, without any objects being permanently fixed upon them; and, in comparing effects of an irritant with geotropism, the author found that

"the initial power of an irritant on the apex of the radicle of the bean is less than that of geotropism when acting at right angles, but greater than that of geotropism when acting obliquely on it" (p. 154).

Mr. Darwin found dry caustic to produce similar effects. He also discovered that

"a thin slice removed by a razor from one side of the conical apex of the radicle causes irritation, like that from an attached object, and induces curvature from the injured surface" (p. 150).

Sachs has shown that pressure at the distance of a few millimètres above the apex causes the radicle to bend, like a tendril, towards the touching object. Mr. Darwin corroborates this, as also another of Sachs' discoveries, that the radicles of many seedling plants bend towards an adjoining damp surface. This peculiar form of sensitiveness resides in their tips, which then transmit some influence to the upper part, causing them to bend towards the source of moisture.

Mr. Darwin next describes the circumnutating movements of the several parts of mature plants. A number were selected from different orders, and especially woody plants, as being less likely to have circumnutating stems, but the result showed that it is a universal phenomenon, the curves described being more or less irregular ellipses, the longer axes of which are directed to different points of the compass, often interrupted by zigzags, triangles, loops, &c. Stolons and runners form no exception, though circumnutating in a very complex manner, being so great in amplitude as to be almost comparable to that of climbing plants. They are thus aided in passing over obstacles, &c.

With leaves Mr. Darwin found it to be so general that he concludes it would not be rash to assume that growing leaves of all plants circumnutate, as is probably the case with cotyledons. The seat of the movement generally lies in the petiole, but sometimes in the blade as well. The periodicity of the movements of leaves is peculiar. They generally rise a little in the evening and the early part of the night, and sink on the following morning. It is determined by the daily alternations of light and darkness.

After having described circumnutation as a general phenomenon of growing organs in the fifth chapter, the author enters upon the field of "modified circumnutation"—that is, where this has become utilised for special purposes. He had previously and elsewhere described the processes of climbing plants, and now only observes that it is an amplified state of circumnutation, probably due to a moderately increased growth spread over a considerable length of the moving organ, preceded by turgescence and acting successively on all sides.

Two chapters are devoted to a full and apparently exhaustive discussion on the sleep or nyctitropic movements of leaves. These consist of the phenomena of an upward or downward movement of leaves and leaflets, of the folding along the mid-rib, of the rotating on the pedicels, &c., the general result being either to protect the upper surfaces by covering them one upon another, by crowding the leaves together, or by placing them vertically. In every case the object is to avoid the evil effects of radiation into the open sky; for Mr. Darwin has proved that leaves compelled to remain horizontally at night suffer much more from radiation than when placed with their edges vertical. One would like to ask the question whether this will account for the phyllodinous species of acacia, as well as the gum-trees, having their foliar organs so often vertical, instead of horizontal, in Australia.

Movements excited by light and gravitation occupy the next four chapters, while the twelfth and last deals with a general summary and concluding remarks.

Heliotropic movements are determined by the direction of light, while periodic movements are effected by changes in its intensity, and not by its direction. Mr. Darwin shows that a heliotropic motion (towards light), apheliotropic (away from light), diaheliotropic (taking up a position transverse to light), and paraheliotropic (avoiding intense light) are all forms of circumnutation; though how the actual causes—themselves not always known—act in producing these effects is unknown at present.

The manner in which organs of plants move towards a lateral light shows that it is evidently the movement of circumnutation which gives rise to or is converted into heliotropism, &c. This view is borne out by the existence of every possible gradation between a straight course towards a lateral light and a course consisting of a series of loops and ellipses. The transmitted effects of light are curious. While observing the accuracy with which the cotyledons of *Phalaris canariensis* became bent towards the light, Mr. Darwin found that the upper part bends first, and afterwards the bending gradually extends towards the base, and even to a short distance below the ground (one-fifth of an inch), though it seems probable that a simultaneous stimulus of the lower part by light greatly favours its curvature.

The motion produced by apogeotropism is sometimes remarkably straight, though generally complicated by zigzags and ellipses, showing that it is clearly an adapted form of circumnutation, a rectilinear course being merely an extremely modified form of it. An organ which, while young, is extremely sensitive to apogeotropism, ceases to be so as it grows old.

Geotropism is, of course, the exact opposite, and finds illustration in all growing roots, though secondary roots and rhizomes are more generally diageotropic, and take a more or less horizontal direction.

Perhaps the most remarkable instance of aërial organs being geotropic is that of plants which bury their seed capsules, as *Trifolium subterraneum*. The various adaptations of the peduncle, of its abortive flowers, &c., are extremely curious, and are especially worthy of perusal. One chief good, Mr. Darwin suggests, is the protection of the seeds from animals. But as the other fruits not buried rarely yield seeds, it seems that the absorptive power of the hairs which clothe them, and which show "aggregation" on the application of carbonate of ammonia, would indicate that they are liable, when exposed to insufficient nutrition for ripening their seeds, not to mature at all.

With regard to the geotropism of radicles, it appears that the tip (from 1 to 1·5 mm.) is alone sensitive, and, when excited, causes the adjoining parts to bend. This was proved by cutting off or cauterising, as well as by covering the tips with grease. Mr. Darwin remarks:—

"To see anything of the above kind in the animal kingdom, 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" (p. 543).

The last chapter is a general summary of the contents of the book. The work is of the profoundest interest and importance, but intensely hard reading. In the vast accumulation of minute details it almost out-Darwins Darwin! But botanists will agree that its great value lies in collecting, testing, and proving the truth of a large series of facts and in bringing them into one common bond—that of "circumnutation." Starting with this as an inherent property due to turgidity of tissues and growth of all organs, the various specialised motions of the parts of plants are due to its modifications in adaptation to external conditions which themselves set up the changes, such external conditions being light, mechanical irritations, &c.

In fig. 149A, of *Desmodium gyrans*, the two small leaflets of each leaf seem to be accidentally omitted. They were possibly not photographed in consequence of their

continual jerking, and so shifting their positions. It would have been desirable to add them from the living specimen.

George Henslow.

OBITUARY.

MR. JOHN GOULD, F.R.S.

Ornithologists, as well as lovers of sumptuous books, have sustained a grievous loss by the death of Mr. John Gould, F.R.S., which took place at his house in Charlotte Street on the 3rd inst. Born in 1804 at Lyme Regis, from early years he showed a love for outdoor pursuits—fishing, shooting, and sketching, together with the practical study of natural history. Botany and floriculture were added to these tastes before he was twenty by a residence at the Royal Gardens, Windsor, under the care of the late Mr. J. T. Aiton. In 1838 Mr. Gould visited Australia, and was greatly assisted by Government introductions in acquiring a comprehensive knowledge of its fauna. On his return in 1840, he at once began to publish the results of his investigations. His first important work, *A Century of Himalaya Birds*, had already appeared in 1832, and, together with other ornithological studies, he had completed *The Birds of Europe*, in five volumes folio, in 1837. Mr. Gould has produced in rapid succession, when their laborious character is borne in mind, *The Birds of Australia*, in seven folio volumes (1848), and *The Mammals of Australia*; *The Birds of Asia*, *The Birds of New Guinea*, also in folio, with coloured plates; and *The Birds of Great Britain*, five folio volumes (1862-73), with an octavo Introduction, the work by which he is perhaps best known to lovers of our native birds. This exquisite book cost twelve years' labour; all the illustrations (by Wolf and Richter), every sky, even every feather of each bird, having been coloured by hand. To open the book at random and light upon such an illustration as that of the *Circus cineraceus* (Montagu's harrier) standing on a mole, which puts up one forepaw as if to deprecate further injury, would alone show the keen eye and artistic taste of this accomplished ornithologist. These great works, which might well satisfy the literary ambition of most men, were but a tithe of the laborious monographs and papers which Mr. Gould published. Mention need only be made of his monographs on the Ramphastidae, Trogonidae, and Odontophorinae (the American partridges), and especially of his gorgeous book on the humming-birds (Trochilidae), and the equally useful one, *The Handbook of Australian Birds*, published in two volumes octavo in 1865, which enumerates more than six hundred and fifty varieties of birds of that country. Indefatigable as was Yarrell in producing papers on his favourite subject, he was far exceeded by Mr. Gould's activity. Up to 1873 the catalogue of scientific papers compiled by the Royal Society shows that he had contributed 229 papers to science. Seldom have the seventy-seven years to which Mr. Gould's life was spared been better spent by a devotee of natural history. The impulse which his numerous writings and their beautiful illustrations have given, not only to his particular study, but also to the development of coloured lithography, cannot easily be estimated. Like Audubon's elephant folios, Mr. Gould's books will always command high prices, as much from their beauty as their usefulness. They owe much of their attractiveness to that love of nature and country pursuits which so often led him, with observant eyes and reflective mind, to seek recreation on the Thames, for, like many other men, Mr. Gould never forgot his studies in his amusements.

By the death of Baron Ercole Dembowski a special branch of practical astronomy has lost one of its most skilful and industrious cultivators. About 1852, when living at Naples, Dembowski began his measurements of double stars by means of a moderate telescope with defective micrometrical apparatus. His first results were published in 1857, and proved him to be an intelligent and zealous observer. In 1860 he settled at Gallarate, near Milan, erected a well-equipped private observatory, and devoted himself with great success to his favourite pursuit, and became one of the most diligent, most accurate, and most trusted observers of double stars. In 1878 the Council of the Royal Astronomical Society gave expression to their high appreciation of his labours by conferring the society's gold medal upon him. His published observations are scattered over some seventy numbers of the *Astronomische Nachrichten*; and, as a great many accurate measurements still await publication, it is to be hoped that all will be collected and made accessible in one substantial volume. Dembowski, who was descended from a Polish family known in political history, died on the 19th ult., in his sixty-ninth year.

NOTES OF TRAVEL.

The Russian Geographical Society are about to send an expedition, in charge of M. Poliakoff, to explore the island of Saghalien.

Mr. Robert Arthington, of Leeds, has lately offered the Church Missionary Society the sum of £5,000 for investment towards providing a fund for the maintenance of a steamer and a staff of agents on the Upper Binue and Lake Chad, on the assumption that there is navigable water-communication between the two, a fact which has not yet by any means been proved.

Herr J. M. Schuver has recently started from Cairo with the intention of traversing the African continent to the Cape of Good Hope. Herr Schuver, who is an experienced traveller, has lately been undergoing a course of scientific instruction in London.

The United States Senate have passed a resolution appropriating the sum of £35,000 for the purpose of fitting out an expedition to search for the Arctic exploring vessel *Jeannette* and the missing whalers, which some believe to be imprisoned in the ice near Wrangel Land.

The current number of the *Monthly Record of Geography* contains two papers—Capt. Holdich's on the geographical results of the Afghan campaign, and Mr. W. Powell's on New Britain and the neighbouring islands. The latter embraces the information gathered by its author during six years' explorations, and adds considerably to our knowledge of a little-known region as well as of its inhabitants. Fortunately, too, Mr. Powell was a practised surveyor, and is consequently able to rectify the blunders of our old maps in that which he gives us with his interesting paper. In the geographical notes prominence is given to particulars furnished by H.M. consul at Loanda respecting the progress Mr. Stanley is making in surmounting the difficulties presented by the Yellala Falls of the Congo, and to a description of the Rev. T. J. Comber's recent visit to the newly discovered Arthington Falls on the River Ambriz. Under the heading of "Irrigation Works on the Lower Jaxartes," the recent efforts of the Russians to fertilise the Kazalinsk district are referred to. M. Montolieu's exploration of the Ynirida River in the upper Orinoco basin is afterwards briefly dealt with. In a letter to the editor, Dr. Koner, of Berlin, furnishes some curious particulars respecting the past history of the Keeling Islands, which, however, it is well to note are drawn from Dutch sources.

The February number of the *Leisure Hour* opens with an interesting account of Mr. E. Whymper's ascents of Chimborazo in January and July of last year, given from the explorer's own letters, &c. With regard to the collections made during the journey, we learn that they include a large number of pieces of pottery, metal, &c., of the time of the Incas. Insects and plants were found at greater heights than previously in the two Americas; and beetles were several times met with among the rocks on the tops of mountains higher than Mont Blanc, while butterflies were caught at an elevation of 16,000 feet, and flies even higher. Mr. Whymper, we may add, is stated to be preparing a work on the Andes which cannot fail to be of value to geographers.

SCIENCE NOTES.

Ethnological Classification.—A paper by Mr. C. Staniland Wake on "The Classification of the Races of Mankind," having been read before the Hull Literary Club, has been printed for private circulation. Mr. Wake admits that in the present state of science a perfect system of classification is scarcely possible, inasmuch as it would need an almost exhaustive knowledge of all anthropological phenomena—physical, mental, and social. He is disposed, however, to follow Dr. Topinard, and to assume, as a good working hypothesis, that all existing races may be classed either as European, Mongolian, or Negro, or as crosses between two or more of these types. At the same time he has grave doubts as to the purity of the Negro type, and looks favourably upon the supposition that it may have sprung from an intermixture of Topinard's European and Mongolian races.

Libration of the Moon.—A valuable contribution towards a more accurate determination of the moon's libration has been made by Dr. E. Hartwig at Strassburg. According to the laws which were found by Dominic Cassini to explain the apparent shifting of spots on the moon's disc, and which have been called after him since their publication in 1721, the moon rotates with uniform velocity, the time of rotation is exactly equal to the mean time of the moon's revolution round the earth, the inclination of the plane of the lunar equator to the ecliptic is constant, and the ascending node of the equator always coincides with the descending node of the moon's orbit on the ecliptic. The effect of these laws is the moon's optical libration. But Cassini's laws cannot be strictly true, as they represent only the average state of the moon's rotation; small periodical deviations produce a physical libration, the amount of which is to be determined from proper observations. The mathematical theory of the moon's physical libration has occupied the talents of some of the most distinguished mathematicians—Lagrange, Laplace, Poisson, and others; and it has been sufficiently solved for the purposes of its practical application. But as the greatest effect of the physical libration in shifting the apparent position of a lunar spot, as seen from the earth, is probably not more than two, or at most three, seconds of arc, and as this effect is, moreover, masked by the effects produced by several sources of uncertainty, the practical determination of the different terms of the physical libration is beset with great difficulties. By a series of fifty observations made with the Königsberg heliometer in 1845, Wichmann made an attempt to determine several of the terms. Hartwig has now made another attempt, and has been successful, in consequence of some improvements in the construction of his instrument, in deducing from his forty-two observations results of considerably less uncertainty than Wichmann's.