MIGRATORY MOVEMENTS OF BIRDS IN 1911–12.[1]

THE report before us forms vol. xxxii. of the Bulletin of the British Ornithologists' Club, and is written on much the same lines as the former reports noticed in NATURE. It affords a considerable amount of valuable information for those who are interested, and they are many, in the fascinating subject of bird-migration. The report is gradually growing, and the instalment for 1912 runs to no fewer than 335 pages. It seems to the writer that certain matter might well, indeed ought, to be omitted. This remark applies especially to the inclusion of practically the whole of the Scottish data for the autumn of 1911, which was published more than a year before by the Misses Baxter and Rintoul.

There are certain species of summer birds—and the marsh-warbler is one of them—about which we have insufficient data regarding the time of their appearance, and we might add departure. The species named is believed to be the latest of all summer migrants to arrive in England, and more information regarding its migrations would be most acceptable. Should not a special effort be made to obtain this? It is also very desirable to know—and this remark concerns all similar reports—on whose authority some of the species recorded are based. For example, who identified the rock-pipits recorded as occurring at the Outer Dowsing lightship in the earliest hours of the morning of March 20? Were wings sent as vouchers, or does the identification rest on the testimony of the light-keepers? Would it not be well to publish a list of all the wings received, or, perhaps better still, to star (*) the species the identification of which has been established by means of wings sent?

There are some *errata* in the report. Among them we note that the Scottish records for the occurrence of the common tern on the remarkably early dates of February 1, 4, and 24 are credited to the little tern! As last words, let us say that those who have not engaged in the preparation of similar reports have no idea of the vast amount of toil entailed. For this the members of the committee deserve our gratitude, in addition to our appreciation of the results of their labours. W. E. C.

SIR DAVID GILL, K.C.B., F.R.S.

DAVID GILL, whose death occurred in London on January 24, was born at Aberdeen on June 12, 1843. At the age of fourteen he was sent to the Dollar Academy, where Dr. Lindsay's teaching imparted to him a fondness for mathematics, physics, and chemistry. He then proceeded to Marischal College and University, Aberdeen, where his love of science increased and developed under the inspiring influence of Clerk Maxwell. He would have liked a scientific career, but his father, a prosperous Aberdeen merchant, wished his son to succeed him. Gill consented with reluctance to enter his father's business, and consoled himself by devoting all his spare time to physics and chemistry.

His special interest in astronomy began in the year 1863, when it occurred to him that Aberdeen was in need of an accurate time standard, like the time-gun which Piazzi Smyth had introduced in Edinburgh. David Thomson, Professor of Natural Philosophy in King's College, Aberdeen, gave Gill a letter of introduction to Piazzi Smyth, whom he visited at Edinburgh, and there made his first acquaintance with an astronomical observatory. On his return to Aberdeen, with Thomson's assistance, an old disused observatory of King's College was refitted. Every clear evening Gill and Thomson went to the observatory and worked with the transit instrument. The observatory possessed a good sidereal clock, and a mean-time clock was obtained, to which contact springs were affixed, so that other clocks, including the turret clock of the college, were controlled by electric currents sent each second from the standard.

When the time-service had become a matter of routine, Gill purchased a silver-on-glass speculum of 12 in. aperture and 10 ft. focus. He himself designed an equatorial mounting, and the heavy parts were made to his working drawings in the workshops of a firm of shipbuilders in Aberdeen. The driving circle, its tangent screw, and slow motion were made by Messrs. Cooke and Sons, but the driving clock with a conical pendulum was made by Gill's own hands. With this instrument he made observations of double stars, &c., and took photographs of the moon. A copy of one of these photographs was recently presented by him to the Royal Astronomical Society, and is of great excellence.

About this time Lord Lindsay (afterwards the Earl of Crawford) was considering the erection of an observatory at Dun Echt. He called upon Gill to examine the instruments and methods he had used in obtaining his lunar photographs. The acquaintanceship soon ripened, and he learned of Gill's wish to devote his time entirely to science. It thus happened that in 1872 the Earl of Crawford offered to Gill the post of director of the observatory which his son was about to erect. Gill had married in 1870, and the acceptance of Lord Crawford's offer involved a considerable pecuniary sacrifice; but neither he nor his wife had any hesitation in gratefully accepting a post which was in such entire accordance with his tastes and interests.

The years 1872–74 were accordingly busily employed in cooperation with Lord Lindsay in the design and erection of the new observatory. Two of the instruments, the transit circle and 15-in. equatorial, were twenty years later presented to the Government, and formed the nucleus of the new Royal Observatory at Edinburgh. A third instrument was the 4-in. heliometer, which was afterwards used to such good purpose at

[1] Report on the Immigration of Birds in the Spring of 1912; also on Migratory Movements in the Autumn of 1911. (London: Witherby, 1913.) Price 6s. net.

Ascension and the Cape. The details of these and other instruments were worked out, domes planned and built, and the telescopes mounted and brought into working order.

Lord Lindsay had arranged to observe the transit of Venus of 1874 in the island of Mauritius, and the task of determining the longitude of his station was assigned to Gill. Aden was connected with Greenwich by telegraph, but for the connection of Mauritius with Aden it was necessary to carry chronometers. No fewer than forty chronometers were taken and carried by Gill single-handed to their destination and back, a task of great anxiety and difficulty, especially at embarkation or landing at places like Suez, Alexandria, Aden, and Mauritius, where only coloured labour was available. A series of excellent determinations of longitude were obtained, and on the return journey the measurement of the base-line for the Egyptian Survey was made, the site selected being nearly in front of the Sphinx.

The expedition to Mauritius was memorable in another way. Though hampered by cloudy weather, Gill and Lindsay determined the solar parallax from a short series of heliometer observations of the minor planet Juno, and demonstrated the high value of this method. This was followed up by an expedition to the island of Ascension to utilise the opposition of Mars in 1877 for the same purpose. Gill having given up his connection with Dun Echt, Lord Lindsay granted him the loan of the 4-in. heliometer; the cordial support of the Royal Astronomical Society assured the necessary financial assistance, afterwards defrayed by the Government Grant Fund of the Royal Society. A delightful account of this expedition is given in "Six Months in Ascension, by Mrs. Gill—an unscientific account of a scientific expedition." An excellent determination of the solar parallax was obtained, and it was shown that for still higher accuracy it would be necessary to utilise the opposition of a minor planet owing to the observational uncertainty in setting on the limb of a planet with a perceptible disc.

On February 10, 1879, Gill was appointed H.M. Astronomer at the Cape. After a few months spent in visiting the principal observatories in Europe, he proceeded to the Cape, arriving there on May 26. The Cape Observatory had, under Gill's predecessors, Fallowes, Henderson, Maclear, and Stone, accomplished valuable work in the determination of the positions of the stars of the southern hemisphere. This important work, which falls naturally to large national observatories, was continued by him. He reduced and published the observations made by Maclear during the years 1849–52 and 1861–70, thus clearing off all arrears in the publication of the Cape observations. During his directorate he published catalogues of the fundamental stars observable at the Cape, of zodiacal stars the positions of which are required in heliometer and other observations of the moon and planets, and of 8560 stars to serve as reference points for the photographs in the section of the international photographic chart and catalogue undertaken by the Cape. He improved and carefully studied the details, such as pivot and circle errors, of the transit circle which had been erected in 1856. But he strongly held to the view that a reversible instrument was necessary for fundamental work of the highest accuracy, and when the purchase of such an instrument had been sanctioned by the Admiralty, threw his whole energy and mechanical and engineering skill into making the instrument the best of its kind. A brief account of its most striking features is given in NATURE for January 15, p. 556. It was only completed at the time of Gill's retirement from the Cape in 1906, but the results obtained by his successor, Mr. Hough, show that it has admirably fulfilled the object of high accuracy and freedom from systematic error.

Knowing what effective use he would be able to make of the 4-in. heliometer, Gill acquired it from Lord Crawford, and took it with him to the Cape. He employed it first in the determination of the parallaxes of nine southern stars which were remarkable for their great brilliancy or the size of their proper motions. In this task he was joined by Mr. Elkin, a young astronomer whose acquaintance he made at Strassburg in 1879. The valuable results obtained by the two observers were published in 1884. After the execution of the work, Gill pointed out to the Lords Commissioners of the Admiralty that a larger instrument was necessary for the further prosecution of research in stellar and solar parallax, and received their sanction for the purchase of a 7-in. heliometer. With the new instrument the parallaxes of twenty-two southern stars were determined with the highest accuracy. The work entailed extremely delicate and careful observations shortly after sunset and before sunrise extending over many months, and, in addition, laborious researches on the values and errors of screws and scale-divisions. This research, in which Gill's personal observations were supplemented by those of Finlay and de Sitter, has been recognised as the high-water mark of astronomical observation, and will probably never be surpassed by visual observations.

For the determination of the solar parallax Gill found that the minor planet Iris would be very favourably situated in 1887, and Victoria and Sappho in 1888. He determined to make observations himself, and secured promises of cooperation from other astronomers who possessed heliometers, and also of meridian observations to secure an accurate framework for the positions of the necessary reference stars. A very extensive programme was carried out, and the observations are discussed in two large volumes of the Cape Annals. The value of the solar parallax was found to be $8''{\cdot}804$, with a probable error of only $\pm 0''{\cdot}0046$. This result has been recently confirmed by the photographic observations of the planet Eros, and still more recently from the spectroscopic observations of the differences of the velocities of stars in the line of sight when the

earth's revolution carries it to or from them. As a corollary to these important researches, the mass of the moon was determined from the displacement of the observer's position, arising from the movement of the earth about the centre of gravity of the earth and moon.

In 1882 photographs of the great comet were taken, under Gill's auspices, with an ordinary camera strapped on an equatorial telescope. Notwithstanding its small optical power, a surprising number of stars were shown in excellent definition over a considerable field. This suggested the possibility of employing similar but more powerful means for mapping the stars. Gill immediately took steps to obtain a suitable lens, and in January, 1885, having obtained 300*l.* from the Government Grant Committee, commenced a photographic *durchmusterung* of the southern sky. Prof. J. C. Kapteyn, of Groningen, volunteered to measure the photographs, and from the cooperation of the two astronomers a comprehensive survey of the sky was made from 19° S. declination to the south pole, containing more than 450,000 stars.

The photographs of this comet were fruitful in another manner. Copies of them, with a short explanatory note, were forwarded to Admiral Mouchez, the Director of the Paris Observatory, and were communicated by him to the French Academy. Their excellence led Admiral Mouchez to encourage the brothers Henry, who were engaged in charting the zodiac, to devote their attention to the construction of astrographic lenses. In this they had signal success, and after further correspondence between Gill and Mouchez, a conference was called at Paris in 1877 for the execution of an international chart and catalogue of the whole sky by photographic means. In this important work Gill took a keen interest and exercised great influence. He attended all the meetings of the Comité permanent in Paris, where he delighted to discuss with his colleagues the details of a great project which has been constantly advanced by his enthusiasm and energy.

Soon after Gill's appointment as H.M. Astronomer of South Africa, he laid before Sir Bartle Frere, who was Governor of Cape Colony and High Commissioner for South Africa, a comprehensive scheme for a geodetic survey of the country. His recommendations included a grid-iron system of principal triangulation extending over Cape Colony, the Orange Free State, Natal, and the Transvaal. There were considerable delays at the start, but little by little the great project was carried out always under the unifying direction of Gill. In 1896 he suggested that the progress made in geodetic survey in South Africa should be regarded as a first step in a chain of triangulation which, approximately traversing the thirtieth meridian of east longitude, should extend continuously to the mouth of the Nile. He never lost any opportunity of forwarding this important geodetic project, and had the satisfaction of seeing the great arc of meridian measured from latitude 31° 36′ in the extreme south of Africa so far north as Lake Tanganyika in lat. 9° 41′.

Gill remained at the Cape as H.M. Astronomer for twenty-eight years. In this period he remodelled the fundamental meridian work of the observatory, introduced photographic astronomy, and achieved results of the highest importance with the heliometer. The generous gift of the Victoria telescope by Mr. F. McClean (a 24-in. photographic telescope with objective prisms and spectroscope) enabled work in astrophysics to be added to the activities of the observatory. In addition to the staff of the observatory, a number of astronomers were attracted to the Cape and worked there guided by Gill's counsel and stimulated by his enthusiasm. In this connection the names of Elkin, de Sitter, Cookson, and Franklin-Adams are readily recalled. In 1905 the British Association visited South Africa, and Gill had the greatest pleasure in showing them the great observatory which owed so much to him. The success of this memorable visit was largely due to the great respect and admiration entertained for Gill by the visitors from Europe and their hosts in South Africa.

He left the Cape in October, 1906, and took up his residence in London. His time was very fully occupied in writing the history and description of the Cape Observatory (see NATURE, January 15, p. 556), and in the activities of a number of scientific societies into which he entered with zest. He served on the council of the Royal Society, 1908–9 and 1910–11; on that of the Royal Astronomical Society from 1907–13, being president from 1910–12, and succeeding Huggins as foreign secretary in 1912; and on the council of the Royal Geographical Society, 1908–10 and 1911–12. He was president of the British Association at the Leicester meeting in 1907. He was constantly consulted by astronomers, particularly in the design of instruments. Another subject in which he was greatly interested was the manufacture of optical glass for large telescopes. His interests embraced not only the practical branches of astronomy and geodesy in which his own work had been done; he followed the recent researches in solar and stellar spectroscopy, in gravitational astronomy, and especially those bearing on the extent and movements of the sidereal system.

The signal services which he rendered to science were recognised by his creation as Knight Commander of the Bath, as Knight of the Prussian Order *Pour le Mérite*, and as Commander of the Legion of Honour of France. Honorary degrees were conferred upon him by the Universities of Oxford, Cambridge, Edinburgh, Aberdeen, Dublin, and the Cape of Good Hope. He was corresponding member of the leading academies of Europe and America. He received the Valz medal of the Institut of France in 1882, the gold medal of the Royal Astronomical Society the same year; the Bruce medal of the Astronomical Society of the Pacific in 1900, and the Watson medal of the National Academy of the United States in the same year; a royal medal of the Royal Society

in 1903, and the gold medal of the Royal Astronomical Society a second time in 1908.

No biographical notice of Sir David Gill would be complete without some reference to his striking personality. His force of character enabled him to triumph over difficulties and carry out great projects. His enthusiasm and tenacity of purpose communicated themselves to his colleagues and assistants, and supported them and him in the arduous details inseparable from astronomical enterprise. But he never lost in these details a clear view of the ultimate purpose of his work. As an astronomical observer he was unsurpassed, the pleasure of making every measurement as accurately as he was able counterbalancing the tedium of making observations of similar character night after night. His engineering skill stood him in good stead, and the perfecting of his instruments was a constant source of delight to him. His administrative success was due in large measure to the confidence he inspired in his staff, and their regard for him both as an astronomer and as a friend.

His health had been excellent since his return to London, and his large circle of friends hoped that he would be with them for many years. He was suddenly seized with pneumonia in December, 1913, and passed away on January 24, after an illness of six weeks. We would tender to Lady Gill our respectful sympathy in her sudden bereavement. F. W. D.

Sir David Gill was laid to his rest on Wednesday, January 28, the funeral being at St. Machar Cathedral, Aberdeen. A memorial service was held at St. Mary Abbot's, Kensington, and was attended by a large number of personal friends as well as representatives of institutions of science and learning, among the latter being:—Prof. Forbes (Edinburgh University), Sir William Crookes and Sir Archibald Geikie (Royal Society), Sir Norman Lockyer (British Science Guild), Lady Lockyer (the Hill Observatory, Salcombe-Regis), Dr. F. W. Dyson, Astronomer Royal, Major E. H. Hills (Royal Astronomical Society), Colonel E. E. Markwick (British Astronomical Association), Prof. H. H. Turner (Oxford University, and, with Major MacMahon and Mr. O. J. R. Howarth, the British Association), Mr. H. F. Newall (Cambridge University), Major Leonard Darwin (Royal Geographical Society), Dr. R. T. Glazebrook (National Physical Laboratory and Optical Society), Dr. W. N. Shaw (Meteorological Office), Dr. P H. Cowell (Nautical Almanac Office), M. Jules Baillaud (representing the director of the Paris Observatory), Dr. A. E. H. Tutton (Mineralogical Society), Mr. W. H. Low (Cape Town Caledonian Society), Captain Lyons (the Science Museum), and Prof. Kapteyn (Groningen University).

DR. R. T. OMOND.

THE death of Dr. R. T. Omond at his house in Edinburgh on the morning of January 27 removes from us one whose name will be permanently associated with the famous Ben Nevis Observatory. Under his direct superintendence on that cloud-capped summit, hourly observations of the important meterological elements were taken night and day for about ten years following 1884; and although his health prevented him doing the observational work for the remaining ten years of the great experiment, his whole mind was given to the completion of the undertaking. He continued as honorary superintendent; and devoted his time and energies to the reduction and discussion of the wealth of observations which had accumulated.

Dr. Omond was associated with Dr. Alexander Buchan in the preparation of the earlier of the four quarto volumes (Trans. R.S.E., vols. 36, 42, 43, 44) in which the observations are tabulated; but of the later volumes he had necessarily sole charge, and from the very beginning, indeed, the main labour of tabulation and proof correction rested with him. In addition to the tabulated observations of pressure, temperature, humidity, wind, rain, snow, &c., these volumes contain discussions and papers on various meteorological questions. There is also reproduced in detail the daily log-book of the observers, a fascinating and suggestive scientific document, containing, *inter alia*, descriptions of halos, glories, and coronæ, on which Omond himself contributed two papers to the Royal Society of Edinburgh. His principal scientific papers are published in the Ben Nevis volumes already mentioned, and in the *Journal of the Scottish Meteorological Society*.

Dr. Omond was educated at the Edinburgh Collegiate and at the University of Edinburgh. He did not follow any of the ordinary courses qualifying for degrees, but devoted himself mainly to study of physics under Prof. Tait; and to geology under Sir Archibald Geikie. He was, indeed, Tait's right-hand man in the investigations on the compressibility of fluids which arose out of the testing of the *Challenger* thermometers. He became a Fellow of the Royal Society of Edinburgh in 1884, was awarded the Keith Prize in 1892 for his Ben Nevis work, and served one term (1901–4) on the Council. The University of Edinburgh conferred on him the honorary degree of Doctor of Laws at the summer graduation of 1913. Hampered though he was latterly by a serious malady, he put through an immense amount of work, and retained to the end the bright, cheerful, unselfish spirit which endeared him to his many friends.

C. G. KNOTT.

NOTES.

WE record with much regret the death, on February 1, in his eighty-fourth year, of Dr. Albert Günther, F.R.S., formerly keeper of the zoological department of the British Museum (Natural History).

THE Postmaster-General has appointed a Committee to inquire into systems of high-speed telegraphy and to report thereon. The Committee will consist of Captain Norton, M.P., Assistant Postmaster-General (chairman), Sir John Gavey, C.B., Mr. J. Lee, Mr. W. M. Mordey, Mr. A. M. Ogilvie, C.B., Mr. W. Slingo, and Mr. A. B. Walkley. Anyone desirous of giving evidence before the Committee should com-