

were obtained by aneroids, standardised by a hypsometer.

The only life seen consisted of two snow petrels at eighty miles, and a skua gull at 125 miles, while no sign of rock was seen.

Longitude observations at three stations on the outward march were repeated on the return, so that the chronometer rate over three sections could be determined, giving good final longitudes.

Between 100 and 200 miles strong magnetic disturbance was evident. Declination chopped round by 90° in as short a distance as ten miles, while reversion of dip gradient was very commonly experienced. From 200 to 300 miles the declination was much more constant, and a steady dip gradient was observed. Continuing this last fair gradient, the 300-mile station was probably about forty miles from a position of maximum dip.

At the extreme western base 200 miles east of Gaussberg, and 1100 odd miles distant from the main base, magnetic conditions were better, but weather conditions were harassing. No magnetographs were provided, but periodic absolute observations were to be taken by the magnetic observer, Mr. A. L. Kennedy. Observations with magnetometer and dip circle were taken when possible. The station was situated on a floating glacier or barrier, and during the year determinations of the azimuth of the mark showed a progressive movement. During the sledge journeys—as far as Gaussberg in the west, and for 150 miles to the east—declinations were obtained at intervals with a prismatic compass, or with a declinometer attachment to a Lloyd-Creak dip circle. Two sets of dip were obtained on the eastern journey.

Term days were kept at the western base when possible by continuous eye readings of declination, while auroræ were observed and several observations of declination taken during active auroral disturbance. The accompanying plan shows most of the declinations and dips obtained. The possibilities of highly disturbed areas are illustrated by the anomalous declinations and dips about 100 to 174 miles. At 132 miles heavy crevasses were found, which seemed to indicate some unconformity beneath the ice-sheet.

Notes by Prof. Edgeworth David.

I have only just received by wireless some of the actual dips obtained by Dr. Mawson with a Lloyd-Creak dip circle other than those already published in Shackleton's work, "The Heart of the Antarctic."

First, at the Nordenskjöld ice-barrier, lat. $76^\circ 14' S.$, long. $163^\circ 9' E.$, the dip was found to be $88.1^\circ S.$; at the Drygalski Ice Barrier Tongue, in lat. $75^\circ 28' S.$, long. $163^\circ 15' E.$, the dip was 87.5° . On the Reeves Glacier, in lat. $74^\circ 48' S.$, long. $161^\circ 30' E.$, it was 87.9° . All these three sets of observations were very carefully taken. Again at lat. $73^\circ S.$, long. $156^\circ 10' E.$, a careful set of observations showed the dip to be $89^\circ 10'$. The next observation, which may not be looked upon as quite so accurate as the others, gave the dip as $89^\circ 45'$, in lat. $72^\circ 42' S.$, long. $155^\circ 40' E.$, and the last observations, also of approximate accuracy only, indicated a dip of $89^\circ 48'$, at a spot thirteen miles to $S. 30^\circ E.$ of our furthest point to N.W., the latter being in lat. $72^\circ 25' S.$, long. $155^\circ 16' E.$

When we reached the spot where we recorded a dip of $89^\circ 45'$, on January 15, 1909, Mawson concluded that as the rate of change of dip had considerably increased in the last twenty-five miles we were close to the edge of the area of the vertical needle. The evening of the same day, when seven miles nearer the south magnetic pole area, Mawson's measurements gave the dip as $89^\circ 48'$. On striking a curve, he estimated that the

actual edge of the region of verticity was only about thirteen miles distant from where our dip of $89^\circ 48'$ was recorded. We had already travelled twenty-seven miles beyond the spot where the results of the *Discovery* observations had placed the south magnetic pole during 1902-3. Accordingly we determined to march on thirteen miles and put up the flag there, as being the edge of the area of the vertical needle. Our proceedings have already been described in vol. ii., "The Heart of the Antarctic," pp. 180-2. During these last thirteen miles we took no observations with the dip circle, the tripod of which we utilised as a mark to guide us back on our return march.

Mawson estimated that the position of our furthest point to the north-west was in lat. $72^\circ 25' S.$, long. $155^\circ 16' E.$ A short distance on our return from the spot considered to be the edge of the area of vertical needle, Mawson experimented with the horizontal needles of an ordinary prismatic compass and a Brunton transit instrument. While he considered both needles worked "dead"—that is to say if the compass boxes were twisted the needles followed them around—it was found that on tapping the boxes and making the needles spin, the more sensitive of the two showed a slight tendency for its south-seeking end to come to rest within the western hemisphere of the compass. Mawson felt satisfied at the time that even if we might not have been within the area of vertical needle, at the particular moment—about 3.30 p.m., on January 16, 1909—when the end of our journey was reached, we were still well within the region of the diurnal swing of that area. In view, however, of the recent remarkable observations by Mr. E. N. Webb, it seems doubtful whether there may not have been some local disturbing influences affecting Mawson's observations on the Shackleton expedition, such as Webb's map shows affected the magnetic observations of Mawson's present Antarctic expedition. Reference to the map will show that at several spots along their route declination varies to the amount of from 40° up to 60° within a distance of only a few miles, and the dip, in some places, lessened considerably, instead of increasing, as the magnetic polar area was approached. This suggests that it is possible that at our furthest point north-west we may have been on the edge of either a local pole, an "outlier" of the main south magnetic polar area, or on a local lobe of the magnetic pole area, or may even have been just outside an area of absolute verticity altogether. By how much, if at all, we may have been outside, can, of course, only be determined when all the magnetic results are reduced, and compared.

MEROË: FOUR YEARS' EXCAVATIONS OF THE ANCIENT ETHIOPIAN CAPITAL.¹

ON behalf of the University of Liverpool, and aided by the support of private benefactors, the lecturer has been at work for four years in scientifically uncovering the ruins of the once-famous Ethiopian capital. When his first expedition arrived upon the scene, there was little to suggest the great extent and interest of the city which has now come to light; in fact, only one wall and a few objects of sculpture were visible above the soil. Now, however, a number of temples, palaces, and public buildings have been laid bare; the walls of the royal city have been traced; and during the past season's work, from which the lecturer has just returned, a considerable portion of this enclosure has been excavated so that a visitor may enter by the city gate and walk along the ancient

¹ Summary of a discourse delivered at the Royal Institution on Friday, April 25, by Prof. John Garstang.

streets, turning right or left at will into the different buildings.

First amongst the greater buildings of the site is the Sun Temple, which is designed in a series of ascending ambulatories with stone-built cloisters, the sanctuary being found on the highest platform, in the middle. A contemporary representation of the building upon its own walls has enabled Mr. W. S. George, the able architect of the expedition, by comparison with actual measurements, to attempt a reconstruction. In character and situation this temple corresponded to the "Table of the Sun" mentioned by Herodotus. An even larger building is the Temple of Ammon, the main axis of which is 430 ft. in length; the high altar and the special enclosure for sacrificing animals, and other interesting features of the temple, are well preserved. Other monuments excavated include an extensive palace presumed to be of Roman period, two small temples, one of which was dedicated to a lion-deity, an ancient temple of Isis, later reconstructed, pottery kilns of Meroitic times, and several hundred tombs of the necropolis. All these features appear to have been outside the chief, or royal enclosure, and it appears that there is still untouched by the excavators' spades a much larger area than has yet been attacked, including the ancient township itself which abutted against the walls of the royal city. The explorer is of the opinion that without a substantial increase in the annual sum available for this work, which up to the present has been almost entirely privately contributed by a few generous benefactors, it will scarcely be possible to complete the undertaking even in ten or fifteen years.

For the last two seasons the excavation has been almost entirely concentrated upon the royal enclosure, in which remarkable discoveries have been made. In one of the royal palaces a hoard of gold treasure and ornaments was found; and the royal baths adjacent, which are on an extensive scale, illustrate in their details the character of the Meroitic arts better than any other features of the city.

Under the threshold of another public building, carefully buried in sand, amid the débris of a building, there was found a beautiful bronze head of Augustus, which is now permanently deposited in the British Museum. A short distance from the spot are the remains of a small temple of Roman style; and the lecturer believes that this bronze head of the divine emperor had once formed the cult object in this temple. Two passages from Pliny seem to have been overlooked by those who have discussed the possibility of a Roman occupation at Meroë. From these it would appear that the imperial soldiers under Petronius had not only reached Meroë, but had passed up the Nile a further 100 miles. During the past winter a bronze coin of Augustus and an increasing number of small objects were discovered, all of which tend to indicate that, for a brief time at any rate, Roman troops actually occupied the city. In this way the fact and circumstances of the discovery of the bronze head would be satisfactorily explained. When Augustus commanded the Roman troops to withdraw, the head was removed from the temple and carefully buried out of danger of violation.

Two main culture periods are traceable in the history of Meroë previous to the Roman occupation. The first was that of its foundation under King Aspelut and his contemporaries, about the seventh century B.C. In this period Egyptian influence in art is freely apparent. The second phase began with an influx of Greek ideas, which may be roughly dated to the third century B.C., corresponding to a record by the historian Diodorus of great reformations instituted by Ergamenes, who had himself been educated in Greek thought in the schools of Alexandria. It is

the second phase which is the most striking in the history of Meroë, and most of the visible buildings and monuments of the site belong to this period. The Roman occupation left little permanent impress upon the civilisation of the locality, but previous and subsequent to the expedition of Petronius there must have been already some influence of Roman contact, which manifests itself in various ways.

Thereafter the history of Meroë became that of a local and somewhat barbarous civilisation, reflecting only faintly the Greek and Roman culture with which it had been earlier infused. A record of the fourth century A.D. tells us how it was sacked by a king of Axum; but as late as the seventh century it would appear that invaders from the same district (Eritrea) overran the city and threw the statues and pictures of the gods into the river.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

LONDON.—An important announcement was published on August 13, to the effect that the President of the Board of Education has appointed a Departmental Committee to inquire and report, after consultations with the bodies and persons concerned, as to the steps by which effect shall be given to the scheme of the report of the Royal Commission on University Education in London, and to recommend the specific arrangements and provisions which may be immediately adopted for that purpose, and as the basis for the necessary legislation. Sir George H. Murray, K.C.B., who was formerly at the Treasury, and later Secretary to the Post Office, has been appointed chairman of the Committee. The other members are Sir Amherst Selby-Bigge, Secretary to the Board of Education, Sir John Rose Bradford, Sec.R.S., Sir William MacCormick, Dr. George Franklin, Dr. Arthur Keith, Mr. John Kemp (one of the secretaries to the Royal Commission), and Mrs. Henry Sidgwick. Dr. Frank Heath, the other secretary to the Royal Commission, is appointed secretary to the Committee.

MANCHESTER.—The council of the University has appointed Dr. A. D. Imms to the newly created post of reader in agricultural entomology. Dr. Imms was formerly professor of biology in the University of Allahabad, and afterwards forest entomologist to the Government of India at the Imperial Research Institute, Dehra Dun. He will be in charge of the researches in agricultural entomology conducted under the scheme approved by the Board of Agriculture and Fisheries. The council, with the assistance of a grant in aid from the Development Fund Commissioners, has provided special laboratory accommodation for these investigations, and will undertake the necessary provision for the work of the department.

A REUTER message from Melbourne reports that a pioneer colonist named Mr. W. Robbie has died at Ballarat, aged ninety-one years, and has bequeathed 30,000l. to Aberdeen University to establish scholarships.

THE vacancy in the directorship of the Agricultural College at Cornell University, caused by the resignation of Prof. L. H. Bailey, has been filled for the time by the appointment of Prof. W. A. Stocking, jun., as acting-director for a term of one year. Prof. Stocking is forty-one years of age, and has been a member of the faculty of the college since 1899.

THE Governor of Pennsylvania has, we learn from *Science*, approved the following State grants made at the last session of the legislature:—The Pennsylvania