

(3) The behaviour in stars of the lines affected in sun-spots appears to be consistent with the view that temperature changes alone are sufficient to account for their variation in intensity. (In this connection the authors formerly were inclined to the view that the presence of sun-spot lines in the spectra of red stars indicated the presence of many spots like those on the sun. Recent work has led them to the opinion that the comparatively low temperature of these stars offers the simplest explanation of the observed phenomena. The latter opinion had previously been arrived at and published by Sir Norman Lockyer in a paper "On the Relation between the Spectra of Sun-spots and Stars."¹) In α Orionis—which from other considerations has been regarded as much cooler than the sun—lines that are strengthened in sun-spots are still further increased in intensity, and in Arcturus, which is always assumed to be intermediate in temperature to α Orionis and the sun, the intensities of its lines have been shown by Mr. Adams to agree remarkably with those observed in sun-spots.

In an addendum to the paper an account is given of further work with (1) the flame of an ordinary arc; (2) a modified form of a Moissan electric furnace.

It was found that the spectrum furnished by the flame of the arc—which is undoubtedly of a lower temperature than the core—showed changes of intensity similar to those observed with the 2-ampere arc and synchronous arc. Comparison of the lines affected in the flame with those affected in the weak arc showed that, of the lines of Ti, V, Cr, Fe, and Mn which were compared, nearly 90 per cent. were affected in the same direction, and of these latter the same proportion were affected to a like amount. Consequently, a large majority of the lines strengthened in sun-spots are relatively strengthened in the flame, while those weakened in sun-spots are relatively weakened in the flame.

The work with the electric furnace was done under conditions which, the authors state, eliminated all possible electrical effects, and left temperature as the only possible agent for producing any variations in intensity of the spectrum lines. Only Mn and Fe were investigated in this way, but the resulting spectra again showed great similarity to the weak-arc spectra, the majority of the lines being affected alike in the two cases.

At the end of the paper a few objections which can be laid against the temperature hypothesis are touched upon.

In a note added on October 2 an observation is included which seems to leave no doubt as to the comparatively low temperature of sun-spots. At least one of the titanium flutings which occur in the flame of the arc has been clearly demonstrated to be present in two of the best spot-spectrum photographs.

The work is regarded by the collaborators as being only at a preliminary stage, but it is evident that it will, with subsequent work on similar lines, have an important bearing, not only on the relative temperatures of sun-spots and photosphere, but also on the temperature classification of stars.

ANTHROPOLOGICAL NOTES.

O the second number of *Bulletins et Mémoires de la Société d'Anthropologie de Paris* (ser. 5, T. vii., 1906) Lieut. Desplagnes contributes an interesting paper on a little-known region of Central Nigeria, lying at the base of the plateau of Bandiagara (Banjagara), in the Massina district. This lake region seems to have been inhabited from the earliest antiquity, and in the Polished Stone period to have supported a dense population at a high grade of civilisation, to which numerous Megalithic monuments and a quantity of stone weapons and implements bear testimony; and long before our era examples of metal working, weaving, pottery, &c., show the industrial stage to which the inhabitants had attained. The character of the remains, physical and cultural, seem to suggest an Eastern origin for these early occupants, who were probably related to the ancestors of the Galla-Somali peoples. Later on, the nomad and pastoral peoples of the Sahara

¹ Roy. Soc. Proc., vol. lxxiv. p. 33.

attracted by the well-watered pastures, poured down from the north, and the tribes from the forests pressed up from the south; but all of these, though attaining right by might, had no aptitude for organised industry, and the primitive inhabitants were utilised as a sort of caste of workers, superior to slaves, but yet not mixing with the conquering clans. In the smiths, weavers, fishers, and potters, are found the descendants of the earlier owners of the land, while others maintained their independence by taking refuge in the islands in the river, the Sorkos, or in the surrounding mountains, the Habbès. The paper deals chiefly with the Habbès, describing their traditions, customs, habits, dwellings, industries, religious ideas, and sociology, in all of which they differ from their neighbours. The illustrations give an idea of the character of the country and the people, and the photographs of the masked figures in the religious dances, supposed to represent the Spirit of the Ancestors, are of particular interest.

L'Anthropologie, Tome xvii., 1906, contains the first instalment of a study by Dr. E. T. Hamy, "Les Premiers Gaulois." Dr. Hamy attempts to trace the physical characters of these invaders of northern Italy in the early Iron age from the evidence of the tumulus burials in France. The evidence is unfortunately very scanty, but it is worthy of note that the skulls in the neighbourhood of the forest of Châtillon have a cephalic index ranging from 80 to 84, with an altitudinal index of 88 to 93, although one skull from Banges, in the same district, has an index of 73.1. This is followed by a paper by Mr. Ed. Piette, "Le Chevêtre et le Semi-domestication des animaux aux temps pléistocènes," with many figures showing clear representations of halters in the engravings from the caves of Brassempouy, Mas d'Azil, &c. This communication forms the ninth in Piette's series of prehistoric ethnographic studies, and his last, for the volume ends with a notice of his death and a recognition of the great services which he has rendered to the science of prehistoric ethnography. The second part of "Les Restes humaines Quaternaires dans l'Europe Centrale," by Mr. H. Obermaier, continues the useful summary of the evidence for Quaternary man in Europe. The cautious tone of the writer is seen in the brevity of the list of human remains "sûrement quaternaires" when compared with the list of "Indications à écarter comme erronées, douteuses ou insuffisantes."

In *Globus*, lxxxix., Nos. 14 and 15, Mr. Vojtěch Frič gives an account of his travels along the Pilcomayo—a tributary of La Plata—in Central Chaco, with notes on the Pilagá and other Indians, and illustrations showing the character of the country and the fine-looking type of inhabitants. Among the majority of these tribes, it may be noted, the women propose marriage to the men, the *modus operandi* differing among the different groups. The method employed by the Pilaga women is to place a certain zigzag mark on a certain tree; the chosen man presents himself, and no further ceremony is needed. No. 17 contains a description, by Dr. Claus Schilling, of the Tamberma, who until a few years ago were an undiscovered people, near the borders of Togo. The illustrations taken by the author show the peculiar architecture and costumes of the district. This paper is followed by a short account of another African people, the Mpororo of the north-west corner of German East Africa, by Oberleutnant Weiss. Nos. 18 and 19 of the same periodical contain articles on the Gold Coast negroes by the medical missionary Dr. H. Vortisch, who gives a review (with illustrations) of their physical features, clothing, character, family life, sociology, political organisation, &c., and a careful record of their musical instruments, thirteen of which are figured. Mr. Erland Nordenskjöld contributes an article to *Globus*, lxxxix., No. 22, "Der Doppeladler als Ornament auf Aymarageweben," tracing the degeneration of the zoomorphic design through varying stages. In a series of papers (in Nos. 11, 20, 24, and xc., 1.) Dr. Theodor Koch-Grünberg describes his travels "Kreuz und Quer durch Nordwestbrasilien," giving excellent pictures of the scenery and of the natives, with a map to show the linguistic grouping. Of particular interest are the native drawings of animals. In xc., No. 4, W. von Bülow criticises the theories of Percy Smith, E. Tregears,

and A. Krämer, on the origin of the Polynesians, and identifies Savaiki (Havaiki, Avaiki, Savaii, &c.) with Java, *i.e.* *sawah* (Javanese)=rice-field, and *iki* (also Javanese) diminutive suffix.

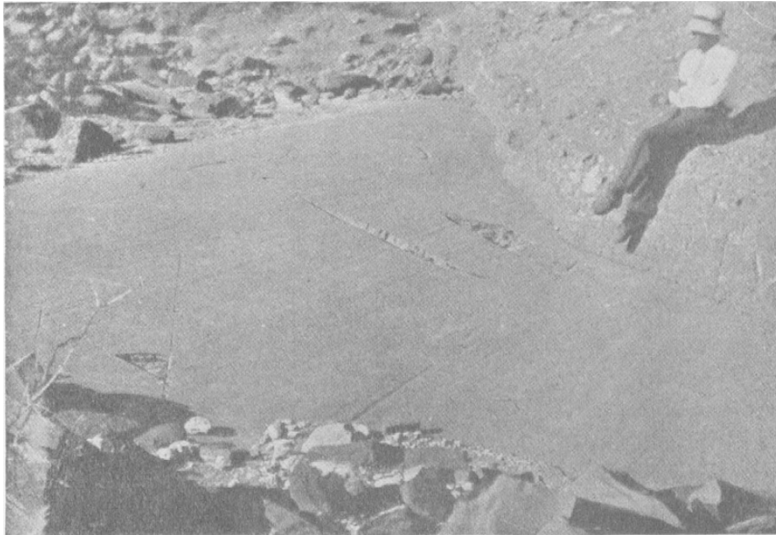
GEOLOGICAL RESEARCH IN SOUTH AFRICA.¹

THE last number of the Transactions of the Geological Society of South Africa cannot fail to attract a greater number of geologists to follow the rapid progress being made in South African geology. This journal once threatened to be the dreariest; it is rapidly becoming one of the most interesting.

The visit of the British Association to South Africa has no doubt directed attention to the many points of interest in the geological history of one of the oldest land masses in the world.

Recent work between the Cape and the Zambezi has shown that the South African rocks present phenomena unparalleled elsewhere. The Dwyka Conglomerate undoubtedly affords the finest study of an ancient Glacial

economic study of the gold-bearing conglomerates and coal deposits. A utilitarian spirit still apparently holds a prominent place among several members of the Johannesburg school of geologists, of which an indication will be found in the present volume. Why, it is asked, is the Transvaal Survey engaged in the investigation of "outside" areas, where "outside" seems to include everything beyond the immediate vicinity of the golden city? Considering the number of ridiculously divergent opinions concerning the age, order of sequence, and stratigraphical relationship of the gold-bearing conglomerates, it is evident that either the problem lies beyond solution or that the secret will be found in the outlying districts. That the enveloping movement around the Central Rand is being rapidly and systematically carried on is shown by the work of the Transvaal surveyors and by that of Mr. Rogers in Griqualand West. The results obtained by both surveys not only justify their existence, but warrant that, in happier times, they will receive a more liberal help. The fuller knowledge so obtained can afterwards be applied to any special economic region with that nicety of attention to detail on which the success of applied geology so much depends. W. G.



This is a very well preserved striated surface of flagstone forming one of a series of such exposures at Blaauwbosch Drift. The striæ run from N.E. to S.W. The grey patches on the glaciated rock, which are only faintly shown in the photograph, are delicate Bushman chippings. The upper rock seen at the top right-hand corner is boulder shale. From "Transactions of the Geological Society of South Africa."

period. With this geologists have become familiar, but no more convincing examples have been found than those of the glaciated surfaces and boulder beds in Griqualand West described and beautifully illustrated by Messrs. Young and Johnson; but the Dwyka is not the oldest glaciation. Evidences of another have been obtained by Mr. Rogers from the Table Mountain Sandstone series, and he now describes a third and much older glaciation towards the summit of the Griquatown series. South Africa is thus yielding information on those points on which the older formations of the northern hemisphere are generally so persistently silent.

The unfossiliferous and lithologically similar pre-Cape rocks have of late years been proved to be built up of several unconformable groups. The number is added to in the present volume. They also contain rocks of a unique character, none more so than the remarkable Blink Klip breccia of the Griquatown series described by Mr. Rogers. This is a brecciated rock, exceeding 200 feet in thickness, formed by the collapse of the Lower Griquatown series into hollows dissolved out in the underlying limestones and dolomites.

That the interesting character of South African geology is not recognised to the full extent it demands is perhaps due to the overwhelming preference hitherto given to the

large, but very important, section of the protozoa which do not get their living in an honest and independent manner, but live as parasites of other animals and nourish themselves on the internal juices of their hosts, it may be in the digestive tract, or it may be in the blood, or in some other organ or tissue of the body. Thus the situations in which protozoa may be found show the utmost diversity of character. It must not be supposed, however, that every minute living thing which can be detected growing or moving in a moist environment is necessarily one of the protozoa. Here we have to draw some distinctions and to eliminate certain types of organisms. In the first place, the protozoa must on no account be confused with the bacteria, a group of organisms which stands sharply apart from other microscopic forms of life. Apart from the bacteria, the world of microscopic life can be further divided into two groups, the one comprising those of animal nature and habit, the other those more distinctly vegetable in their mode of life. The distinction between plant and animal when applied to these lowly forms of life is, however, a most unnatural and artificial line of cleavage. It is impossible, therefore, to use vegetable or animal characteristics as a criterion for separating these minute organisms into natural groups. For this reason it has been proposed to unite all these primitive forms of life into one group

¹ Transactions of the Geological Society of South Africa. Vol. ix., January to April, 1906. Pp. 1-56. (London: Wm. Wesley and Son.) Price 15s.

¹ Abridged from the inaugural lecture delivered before the University of London on November 13 by Prof. E. A. Minchin, Professor of Protozoology.