

sums" now being spent upon the roads of Wisconsin. For the years 1907-1911 the appropriation by the State for highway purposes was 2000l. per annum, in 1912 it was 80,000l., in 1913 170,000l., in 1914 it had risen to 246,000l., and these figures represent less than one-third of the total amount spent on State-aided roads in the corresponding years. It must be remembered, however, that ten years ago there were practically no stone roads beyond the town boundaries.

The scheme of the report is excellent: part i. is a short introduction to the characters of the available road stones and to the methods of testing; part ii. deals with limestone, which appears to be the most convenient stone for use on the roads. The quarries in each county are described separately, and county maps show the distribution of the stone and quarries. Tests for each quarry were made by the Office of Public Roads (U.S. Department of Agriculture), part of the cost of which was borne by the State Highway Commission. The report of necessity possesses more local than general interest, yet it might well be taken as a model by the Geological Survey of Great Britain, which mentions quarries in a casual way in its memoirs, but has not yet produced one in which all the facts relating to a single important branch of the quarry industry are readily accessible.

Staffordshire. By W. B. Smith. Pp. xi+155. (Cambridge: At the University Press, 1915.) Price 1s. 6d. net.

IN dealing with a county which includes two great manufacturing areas, an author might have been pardoned for giving an emphasis to the industrial character of Staffordshire, and for dwelling at length on the conditions which make Staffordshire the third county in industrial importance. Mr. Smith, however, has wisely balanced the more prosaic and unlovely areas against the beauty spots, such as Dovedale and the Moorlands, and the grimy factories against the fairer farms and the charming parks. The reader is introduced to dales comparatively unknown outside the county, to isolated items of interest such as the wild goats in Bagot's Park, and the Horn Dancers of Abbots Bromley. Those who have some acquaintance with Staffordshire will find much that is new in this book, which maintains the high standard of the series.

Catalogue of the Books, Manuscripts, Maps, and Drawings in the British Museum (Natural History). Vol. v., SO-Z. Pp. 446. (London: Printed by Order of the Trustees of the British Museum, 1915.) Price 20s.

THIS volume of the catalogue of the collection of books, maps, and drawings in the Natural History branch of the British Museum brings the series of entries under the authors' names down to the end of the alphabet. The plan of the catalogue is that of the previous volumes, and was described when these were noticed in these columns.

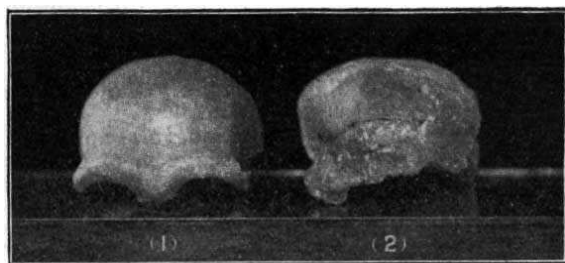
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LETTERS TO THE EDITOR.

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Palæolithic Man in South Africa.

IN November of 1913 Mr. J. L. Groenewald, a farmer, of Adelaide, C.P., showed me some pieces of fossil bones, explaining that he had obtained them from a friend's farm at Boskop, in the Transvaal. He wanted my opinion as to whether they were human or not. I pronounced them to be portions of a human skull-cap of some very ancient race, and prevailed upon him to give them to me. A subsequent examination, after the parts had been fitted together and measured, made it clear that it was of a race as



Front view of the two skull-caps. (1) Neanderthal; (2) Boskop.



Back view of the two skull-caps. (1) Boskop; (2) Neanderthal.



Side view of the Boskop skull-cap, in comparison with the typical Neanderthal skull-cap. (1) Boskop skull-cap; (2) Neanderthal skull-cap. The forehead parts face outwards.

ancient, or more so, than the Neanderthal or the La Chapelle man. It bears a close resemblance in shape, thickness, and measurements to the former. The skull is as completely fossilised as the Karoo fossil reptiles. That it is of vast antiquity is certain.

This Boskop man differs from the typical Neanderthal type in having a lesser development of the

frontal sinus, and a somewhat greater development of the forehead. This would indicate that the Boskop man was of the Neanderthal race, but more advanced in intelligence than the type specimen.

The discovery of this skull offers an explanation of the origin of the Palæolithic implements which are scattered in such vast profusion all over South Africa, and should it prove to be of the true Neanderthal race, as I have absolutely no doubt is the case, we then possess evidence that this remotely ancient type of man migrated into South Africa, and if we conclude the stone implements with which the country is strewn are his handiwork, then he must have existed here in large numbers.

Mr. Piet Botha, the owner of the farm on which the skull-cap was found, readily granted permission for me to excavate. I excavated the site of the find in person, and discovered portions of a rib and collar-bone, part of the mandible with a tooth in it; some more fragments of the skull, and a few roughly chipped stone implements. The remains were found at a depth of 6 ft. in alluvial gravel. On application, the South African Royal Society subsequently made a grant to this museum of 100l. to carry on further excavations. The result was disappointing, a small portion of a human thigh-bone being the only result of this more extensive excavation.

The skull-cap and other remains are now in the temporary possession of Dr. Peringuéy, of the South African Museum, where a careful and detailed examination is being made, but which cannot be completed until various data and measurements are procured from Europe. The first report will appear in the *Journal of the South African Royal Society*.

F. W. FITZSIMONS.

Port Elizabeth Museum, Port Elizabeth,
June 30.

MR. FITZSIMONS'S letter is the first authentic account published in Europe of the discovery of ancient human remains at Boskop Farm in the Transvaal. There can be no mistake about the importance of the discovery; the remains of Palæolithic man have at last been found in South Africa. As regards the nature or race of the individual thus found there is room for doubt; an examination of the photographs of the skull-cap reveal none of the characteristic features of Neanderthal man; one can exclude that race with some degree of certainty. The individual to whom the skull-cap belonged was apparently of the modern type, with a head of remarkably large dimensions. European and American anthropologists look forward with great interest to the publication of a detailed account of the Boskop discovery.

ARTHUR KEITH.

Surface Tension and Ferment Action.

THE correspondence in *NATURE* of June 17 and July 22 by Dr. Cramer and Drs. E. F. and H. E. Armstrong on the possibility of the enzymic action of invertase being limited by surface tension, has led me to look up the laboratory records of some experiments which I made in 1892 on a cognate subject. I was at that time engaged in studying the formation of starch granules in various parts of the living plant, and the subsequent dissolution of the granules under the action of the cell enzymes.

In the course of this inquiry I came across a curious fact which suggested that the action of the diastatic enzyme is to some extent dependent on physical conditions existing at the limiting surface of the starch granule and its surrounding medium. Briefly stated, this fact is as follows.

If we mix with a dilute cold-water extract of malt a little solid starch of a kind which is readily attacked by diastase, *e.g.* that from buckwheat or barley, a microscopic examination will generally indicate a very appreciable erosion and partial disintegration of the granules within twenty-four hours, the actual time depending on the initial concentration of the enzyme. If a parallel experiment is so arranged that, with all other conditions remaining the same, the starch granules are kept in suspension by the addition of about 3 per cent. of gelatine, then we invariably find that the rate of erosion and dissolution of the starch is very much accelerated. This difference is also found to occur even if the mobile liquid which contains no gelatine is kept in continuous movement by mechanical means.

It appeared to me that very possibly the lowering of the surface tension of the liquid by the gelatine had enabled the large-moleculed diastatic enzyme to penetrate the granule with greater facility, and since the starch granules in plant-cells are suspended in highly colloidal protoplasm we might here have some sort of explanation of their rapid disappearance under the influence of very small amounts of active enzyme.

Reasoning from these facts, I drew the conclusion that in a given mixture of starch and enzyme we ought to find a diminution in the rate of erosion in those parts of the liquid which are in a state of tensile stress.

My first experiments in this direction were made in a flattened thermometer tube with an elliptical bore having a major axis of 0.4 mm. and a minor axis of 0.2 mm. The bore of the tube was charged with the diastatic liquid containing the starch-grains, which could be kept under microscopical observation through the walls of the tube. Under these conditions, the starch granules invariably showed a much higher resistance to erosion than did those of the same liquid contained in a small flask or beaker under similar conditions of temperature. At first sight this experiment gave some support to the idea of surface tension playing a part, but in a variation of it in which I used a thin film of the starch mixture between two inclined glass plates, I could find no difference in the rate of erosion in layers varying in thickness from 0.3 mm. downwards.

I then proceeded to investigate the action when the starch had been deposited in the interstices of porous substances, and in the first place used glass-wool, which was one of the substances employed by Messrs. Beard and Cramer, as described in their recent paper in the *Proceedings of the Royal Society* (vol. lxxxviii., ser. B, p. 575), on surface tension and ferment action. Under these conditions the erosion even of buckwheat starch, which is the most sensitive to action of this kind, *was entirely inhibited*, no matter how long the reaction was allowed to continue. For a short time I was misled by this result, and it was only after I had recognised the distinct alkalinity of the solutions which had been in contact with the glass-wool that I found the *causa causans* was of a chemical and not of a physical nature. Diastase, like invertase, is extremely sensitive to traces of alkali, and can only exercise its maximum effect in a slightly acid medium.

I satisfied myself that this was the true explanation by substituting for the glass-wool in the last experiment other porous substances, such as asbestos, cotton-wool, and filter paper. When the whole of the inhibitive effect disappeared. Thus failed my attempt to link enzymic action with surface tension, and even the original phenomenon with which I started, the apparent enhancing effect of a colloid like gelatine, admits of a different explanation based on the slightly acid reaction of the commercial product. It is now well