reception by means of this same bedstead as the antenna to anyone interested.

BENJAMIN S. T. WALLACE.
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### Sub-Red Crag Flint Implements and the Ipswich Skeleton.

I WOULD like Mr. Sutcliffe to read p. 199 of vol. i., part ii., Proceedings East Anglian Prehistoric Society, which contains the original description of the discovery of the Ipswich man. I think it would have been better if he had done this before publicly accusing me of inconsistency in regard to this matter.

J. REID MOIR.

## *THE OXYGEN CONTENT OF THE ATMOSPHERE.*[1]

THIS memoir, published under the auspices of the Carnegie Institution of Washington, is of a type with which we are becoming increasingly familiar—a publication, in fact, which, it may be argued, the institution was created largely to undertake. None of the regularly constituted scientific societies would probably charge themselves with the issue of such a work, and it is very unlikely that it would see the light if left to private enterprise. Nevertheless, it is an eminently useful work, and will be welcomed by chemists, meteorologists, and physiologists alike.

The work is divided into two parts. Part i. is wholly concerned with an historical account of the development of the methods for determining oxygen, in which practically everything contained in the literature has been put together and collated, from the days of Scheele and Priestley to those of Regnault and Bunsen, von Jolly and Morley, down to the methods of our own time depending upon purely absorptiometric processes. Naturally there is nothing very original in this section, and it is well-trodden ground to all who are familiar with the development of eudiometry. It is, however, an interesting and useful compilation, and will be of service to those who are concerned with accurate gasometric analysis, especially in relation to the atmosphere, or who desire to know all there is to know relating to its history.

The second and more immediately important part deals with the experimental work of the nutrition laboratory of the Carnegie Institution, Washington, of which Prof. Benedict is the director.

For some time past the nutrition laboratory has been engaged, among other things, in an elaborate inquiry into the nature of respiratory exchange in relation to metabolic processes, and the necessary instrumental equipment has now been brought to a very high degree of precision. After a careful investigation into the merits of the various types of modern absorptiometric apparatus, it was decided that the arrangement devised by Dr. Klas Sondén, of Stockholm, a development of the apparatus originally contrived some years ago by Prof. Pettersson, more fully fulfilled the essential conditions of expedition, convenience and accuracy than any other existing form; and part ii. is practically made up of a description of the Sondén air-analysis apparatus, illustrated by photographs and woodcuts, together with an account of the plan and methods of research to be undertaken by it, with the results which have been obtained up to the date of publication of the report.

The principle of the apparatus is essentially that of the original Pettersson instrument, in which the absorption and determination of the carbon dioxide and oxygen are made, as in the Hempel, Orsat, and Haldane arrangments, by means of caustic potash and alkaline pyrogallate, but with the use of water-jackets and compensating pipettes so as to ensure much greater accuracy of reading.

The plan of the research involved (1) the estimation of the comparative oxygen-content of uncontaminated outdoor air under all conditions as to wind direction and strength, temperature, cloud formation, barometer and weather, including rain, snow, fog and mist; (2) a study of the influence of the temperature of the reagent upon its absorptive power; (3) an examination of the air over the North Atlantic Ocean; (4) on the summit of Pike's Peak; (5) in the crowded streets of Boston and in the subways of New York and Boston.

Such a programme necessitated a very large amount of experimental work and the analysis of many hundred samples of air. In addition, a large volume of work was needed in control and verification, and especially in tracking down and eliminating sources of possible error. Eventually a routine method was established, and from a long series of determinations it would appear that, as regards oxygen content of outdoor air, no material fluctuation could be detected over a period extending from April, 1911, to January, 1912. This constancy was maintained in spite of all possible alteration in weather conditions, barometric or thermometric changes, or changes in humidity, wind direction, and strength; furthermore, the experiments were made before, during, and after the vegetative season. The average result of 212 analyses showed 0·031 per cent. of carbon dioxide and 20·952 per cent (corrected) of oxygen. Hence Dr. Benedict concludes "that air is a physical mixture with the definiteness of composition of a chemical compound." We have, in fact, got back to the position maintained by Cavendish in 1783 and by de Marli in 1787, that is, of the uniform constancy of the composition of normal atmospheric air, so far as regards its oxygen content.

Prof. Benedict further concludes that—

While the combustion of fuel and the vital processes of men and animals result in a local increase in carbon dioxide and decrease in oxygen on the one hand, and vegetable growth results in a decrease in carbon dioxide and increase in oxygen on the other, the extraordinary rapidity with which the local variations in the composition of the air are equalised is accentuated by the observations on street air, which show but the slightest trace of an oxygen deficit.

[1] The Composition of the Atmosphere, with Special Reference to its Oxygen Content." By F. G. Benedict. Pp. iii+115. (Washington, D.C.: arnegie Institution of Washington, 1912.)