that the two logs will be exactly the same if a uniform motion of any amount is superposed on the system. However, to show this would go beyond the scope of this communication.

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Sept. 30.

X-Ray Study of Scarbroite

VERNON, in 1829 [1], first described scarbroite as a soft white aluminous substance filling veins in a sandstone occurring on the Scarborough coast, but did not give properties sufficiently distinctive to identify the mineral with certainty. Since then, few reports on it have been published, although the American Petroleum Institute Research Project No. 49 on clay minerals[2] lists the substance, and surmises that it consists of a mixture of clays. We have examined similar material from the same locality and environment, and conclude that it is identical with Vernon's scarbroite, but a preliminary X-ray study provides evidence that it exists as a mineral in its own right.

Our specimens were obtained from vertical fissures in the sandstone in South Bay, Scarborough, and in appearance are white, fine-grained and compact, but quite soft and in many cases damp and easily crumbled. Spectrographic and chemical analyses show that the principal constituent is aluminium, with only traces of other ions: while silica is certainly present, X-ray photographs show that it must be largely in the form of free quartz. Although a full quantitative analysis remains to be carried out, it seems likely, therefore, that the material is a highly hydrated aluminium oxide. The specific gravity is approximately 1·85 and the mean refractive index 1·509; the material does not yield single crystals large enough for other optical measurements.

Scarbroite is sufficiently fine-grained in its natural state to give continuous X-ray powder lines which are even fairly diffuse on some photographs. An X-ray powder pattern of a typical specimen is given in Table 1, the photograph being taken with monochromatized cobalt K_{α}-radiation on a Guinier-type transmission camera of effective diameter 22·9 cm. The intensities are estimated visually.

Table 1. INTENSITIES, *I*, AND LATTICE SPACINGS, *d*, OF X-RAY REFLEXIONS FROM SCARBROITE

I	*d* (A.)	*I*	*d* (A.)	*I*	*d* (A.)
10(*b*)	8·64	5	3·93	4	2·495
6	8·30	7	3·71	6	2·443
7	6·52	6	3·48	2	2·393
7	5·97	4	3·25	6	2·360
4	5·72	2	3·17	2	2·322
4	5·61	1	3·08	7	2·219
6	5·00	4	3·03	5	2·148
4	4·89	3	3·01	4	2·129
7	4·72	5	2·983	3	2·070
6	4·44	2	2·860	5	1·991
3	4·37	6	2·816	4(*b*)	1·822
8	4·32	3(*b*)	2·761	4	1·624
6	4·29	4(*b*)	2·702	7	1·450
4	4·15	4	2·629	8(*b*)	1·430
5	3·96	4	2·554		

(*b*) = broad

Different specimens of the material show slight variations from this pattern, which may be due both to the presence of small quantities of other materials and to the co-existence of different states of hydration. The pattern can be indexed tentatively on the basis of a primitive rhomb-based hexagonal cell with $a = 34·5$ A. and $c = 17·3$ A., the 8·64 A. reflexion being 0002.

Specimens heated to 120° C. for two days in air or dehydrated over phosphorus pentoxide for three weeks show minor changes in their powder patterns which can be interpreted as due to a small reduction in the c-axis. On heating to 130°–140° C. in air for several days, a completely different pattern is obtained which again can be indexed on the basis of a hexagonal cell with $a = 31·0$ A., $c = 12·8$ A. Heating to higher temperatures causes the X-ray reflexions to become more diffuse and progressively fainter, while the c-axis shrinks considerably, the lowest recorded value being 11·3 A. at 228° C. At temperatures higher than this, heating for two days or more causes the crystallites to break down completely, no X-ray powder pattern being obtained. At 900° C. a very diffuse pattern of γ-Al_2O_3 emerges.

Further study of the mineral is in progress.

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[1] Vernon, W. V., *Phil. Mag.*, 5, 178 (1829).
[2] American Petroleum Institute Research Project 49. Reference Clay Minerals (Columbia University, New York, 1951).

Velocity of Compressional Waves for a Stratigraphic Profile of Chalk at Flamborough, Yorkshire

A LABORATORY determination has been made of the velocity of compressional waves in a stratigraphic section of the Chalk at Flamborough, Yorkshire. The Chalk ranges from Cenomanian to Senonian in age, and a thickness of about 378 metres is seen in the fine exposures around Flamborough Head[1]. Thirty samples were collected, at twelve stations distributed throughout the section, representative samples being chosen at each station. These were kept moist after collection and the very small amount of included air removed by saturation in a vacuum. The velocity

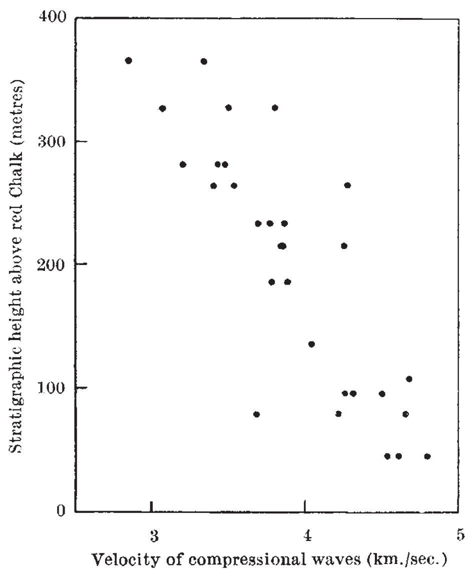

Fig. 1. The velocity of compressional waves for a stratigraphic profile of Chalk at Flamborough