Dr. G. T. Prior: Re-determination of Nickel in the Baroti and Wittekrantz Meteorites. Precipitation with ammonia was found not to separate iron from nickel completely, however often the operation was repeated. Re-determination showed that the proportion of iron to nickel in the case of both the meteorites in question was nearer 6 : 1 than 10 : 1 as previously stated.—Dr. L. L. Fermor: Ice Crystals from Switzerland. Last winter the surface of the snow in shady situations near Zweisimmen and Lenk was often characterized by a dense growth of hollow prisms formed of a thin shell of ice coiled spirally parallel to the face of a hexagonal prism.—Dr. L. L. Fermor: Hematite from the Kallidongri Manganese Mine, India. The crystals, which had the habit of corundum and were marked with three sets of striations due to twin lamellation parallel to 100, showed the forms 111 and $61\bar{4}$ well developed, together with 100, $22\bar{1}$, 28.28.13 (a new rhombohedron), $51\bar{3}$, $71\bar{5}$, and $10\bar{1}$ less prominent.—H. B. Cronshaw: A variety of Epidote from the Sudan. A mineral discovered by Mr. G. W. Grabham in a pegmatite vein closely resembles allanite in appearance, but is free from rare earths and agrees in composition with epidote; in its pleochroism and negative sign it also resembles the latter, but has an abnormally low optic-axial angle of about 54 degrees. In thin section it represents a well-marked zonal structure.

## CORRESPONDENCE.

### SATURATION OF MINERALS AND GENESIS OF IGNEOUS ROCKS.

Sir,—The separation of the different mineral components of an igneous rock is so complex a question that it requires a careful study of each individual rock type, with every effort to follow the different vicissitudes to which it has been subjected from its original state of a homogeneous, vitreous paste, through its magmatic differentiation till its final cooling, not to speak of subsequent changes. In the vast majority of somewhat ancient rocks that are only exposed by erosion the time occupied by this may represent very considerable changes subsequent to complete consolidation.

I fully agree with Mr. A. Scott[1] in his protest against the classification of rocks independent of their 'cooling history', or, to put it more correctly, he agrees with me! The American classification of rocks I look upon as many steps backwards by this introduction of a cumbersome nomenclature and diagrams, interesting perhaps to the chemists, but murderous to the true naturalist or geologist. It hides the beautiful forms of geological phenomena under a gaudy patchwork mantle of mostly untenable hypotheses spangled with fantastical names. I say that Mr. A. Scott agrees with me, for, if he will consult the papers quoted below,[2] he will find himself forestalled in

[1] See Geol. Mag., July, 1914, pp. 319–24.

[2] "Geology of Vesuvius and Monte Somma": Q.J.G.S., vol. xl, pp. 35–119, 1884. "Some Speculations on the Phenomena suggested by a Geological Study of Vesuvius and Monte Somma": Geol. Mag., Dec. III, Vol. II,

many facts marshalled by him in his discussion of Professor Shand's paper in the GEOLOGICAL MAGAZINE.[1]

It is for nearly thirty years now that I have been preaching the same sermon—the 'cooling history' or, as I prefer to call it, the 'vicissitudes of consolidation', which I may sum up under the following heads:—

1. Primary composition of the paste.

2. Additions, or rather acquisitions, to it in its progress from its source to its final position: (*a*) assimilation of materials from its enclosing rock, (*b*) materials brought to it with the assimilation of saline solutions, gases, etc., otherwise *endosmotic* metamorphism.

3. Losses from it in its progress from its source to its final position: (*a*) abandonment of materials to its enclosing rock, (*b*) losses of soluble materials to fluids circulating in its vicinity, or losses of volatile constituents escaping by pores, fissures, or a chimney opening to the atmosphere, etc., otherwise *exosmotic* metamorphism.

4. Rate of cooling or interruptions of cooling: (*a*) to surrounding rocks, (*b*) loss in the acquisition of $H_2O$ or other materials, volatile or otherwise, (*c*) conduction by surrounding rocks, (*d*) evolution of volatile materials, (*e*) vesiculation, or the conversion of volatile materials from the volume of a liquid dissolved in a liquid to the state of a gas, (*f*) ebullition and sublimation of volatile materials by fumaroles or an open volcanic vent.

5. Diminution, rapid or slow, and other vicissitudes of pressure.

I was able to show that, of the sister minerals, orthoclase was formed under high pressure, whilst leucite was individualized under low pressure and principally at an open volcanic vent, as exhibited by the large crystals of leucite growing over big plates of sanidine. The same was shown with regard to amphibole and augite. Furthermore, the presence of small quantities of some bodies that have been called mineralizers, but may well be called catalyzers, may be added to my list of 'vicissitudes of consolidation'.

What determines, for instance, in low-pressure minerals, the final separation of the three felspathoids, leucite, haüyne, or nosean, all of which appear in almost identical conditions in the lavas of Monte Vultura and other localities? Why do abyssal minerals, such as amphibole, sommite, biotite, and, I can lately add, garnet, be deposited under practically no pressure in the loose pipernoid tuffs of the Campania? I have specimens of bones of *Cervus elaphus* (which I have described) covered with crystals of amphibole and a nepheline mineral (sommite or micro-sommite) and biotite, which must have been deposited at so low a temperature that even now the gelatinous constituent of these bones has not been carbonized, but, by heating over a flame, can be blackened yet covered, as such specimens

pp. 302–7, 1885. "The Relationship of the Structure of Igneous Rocks to the Conditions of their Formation": Sci. Proc. R. Dublin Soc., N.S., vol. v, pp. 112–56, 1886; see also Q.J.G.S., vol. xli, pp. 103–6. "On the Fragmentary Ejecta of Volcanoes": Proc. Geol. Assoc., vol. ix, pp. 421–32. "The Causes of Variation in the Composition of Igneous Rocks": Nat. Sci., vol. iv, pp. 134–40, 1894.

[1] See paper by Professor S. J. Shand in GEOL. MAG. for 1913, pp. 508–14.

are, by a crust of these silicates.[1] In this case there is no doubt that fluorides contained in the tuff magma were the catalyzers or mineralizers.

When we have solved all these problems, then will be the time to institute a true classification of rocks and their mineral constituents, but until then any of the recent attempts to do so only hide our ignorance under a cloud of fantastic but unfounded generalizations. The 'saturation of minerals' is, I contend, more accurately represented by my 'principle of fraction exhaustion'.

H. J. JOHNSTON-LAVIS.

VITTEL (VOSGES), FRANCE.
*July 16, 1914.*

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## OBITUARY.

### REV. OSMOND FISHER, M.A., F.G.S.,

HON. FELLOW AND LATE TUTOR OF JESUS COLLEGE, CAMBRIDGE.

BORN NOVEMBER 17, 1817. DIED JULY 12, 1914.

So lately as last June we claimed our dear and valued friend, the Rev. Osmond Fisher, as one of the four surviving contributors to the opening volume of the GEOLOGICAL MAGAZINE in 1864, and now in August we have to record his loss. He passed peacefully away on Sunday, July 12, after an honourable and useful life of 97 years, retaining his faculties active until the end.

Those who *knew* him need no record of his worth; for the younger generation of geologists, we may refer them to his life and portrait which appeared in the GEOLOGICAL MAGAZINE for February, 1900, pp. 49–54.

From a very early age Osmond Fisher displayed a keen interest in geology, and was an assiduous collector of fossils in Dorset and Wilts. When at King's College he attended lectures by Lyell and Daniell and visited the galleries of the British Museum. He entered Jesus College, Cambridge, in 1836, taking up mathematics, in which he graduated as 18th Wrangler in 1841. Whilst at Cambridge Fisher attended Sedgwick's lectures and soon a warm friendship followed, and later on, in 1852, Sedgwick proposed Fisher as a Fellow of the Geological Society.

Besides the numerous papers which Osmond Fisher communicated to the Geological Society, the Philosophical and the Geological Magazines, the British Association, and elsewhere, he published a most important work, *The Physics of the Earth's Crust,* to which subject he devoted fully thirty years of his life, and expended the best efforts of his mathematical powers to perfect.

The Geological Society, always anxious to welcome the contributions of mathematical geologists, awarded him the 'Lyell Fund' in 1887, and the Murchison Medal in 1893; but the crowning recognition of his life's work, the award of the Wollaston Gold Medal, did not take place until 1913, probably owing to the retirement in

[1] "On the Formation at Low Temperatures of certain Fluorides, Silicates, Oxides, etc., in the Pipernoid Tuff of the Campania": GEOL. MAG., Dec. IV, Vol. II, pp. 309–13, 1895.