THE RARE EARTHS

Gmelins Handbuch der anorganischen Chemie
Achte völlig neu bearbeitete Auflage. Herausgegeben von der deutschen chemischen Gesellschaft. System-Nummer 39: Seltene Erden. Lief. 1: Einleitender Überblick, Geschichtliches, Vorkommen. Pp. 122+iv. (Berlin: Verlag Chemie, G.m.b.H., 1938.) 14.25 gold marks.

THIS part of Gmelin's "Handbuch" contains a historical account of the discovery and occurrence of the so-called 'rare earths', a description of their minerals and an account of their geographical distribution. The discovery of large deposits of monazite sand in Brazil, in North and South Carolina and in India has perhaps rendered the designation rare earths misleading, but it is in common use, although in this work the term includes the elements scandium and yttrium as well as the fascinating cluster of elements which bridges the gap between barium and hafnium.

In spite of much previous work dating back to the year 1794, the mystery of this cluster remained unsolved until the work of Moseley on atomic numbers and of Bohr on atomic structure provided the solution. The number of elements was fixed at fifteen, of which all but one are definitely known. The existing data about No. 61, which is called illinium or florentium, are derived from X-ray spectral lines in the *L*- and *K*-series. The unusual similarity of chemical properties of the others is associated with peculiarities of atomic structure, the outer shells of electrons being alike in all cases.

The most characteristic property of the group is their paramagnetism, which begins at cerium and increases progressively to lutecium. This property is associated with the occurrence of valency electrons in the fourth quantum group. Moreover, whereas the basicity of the tervalent elements increases from aluminium to lanthanum, it decreases very slightly but steadily from lanthanum to lutecium. A similar increase and decrease is noticed in the dimensions of their ionic radii (the lanthanide contraction). No mention is made of the recent work of Klemm and Bommer, which reveals a periodicity of atomic volume with high peaks at europium and ytterbium.

Modern views on crystal structure have had an important bearing on the development of geochemistry. The rare earth minerals occur chiefly in granites and pegmatites, and their occurrence is determined more by lattice dimensions than by valency; the small ionic radius of aluminium seems to render it incapable of replacing rare-earth metals to form isomorphs.

A comprehensive table gives the proportions of the various elements in many minerals as deduced from spectral intensities.

MECHANICS OF SPORE DISCHARGE IN TERRESTRIAL PLANTS

Spore Discharge in Land Plants
By Dr. C. T. Ingold. Pp. vii+178. (Oxford: Clarendon Press; London: Oxford University Press, 1939.) 7*s*. 6*d*. net.

DR. INGOLD has for some time paid special attention to the discharge of spores, particularly in the group of fungi, stimulated as he gratefully acknowledges by the important contributions Prof. A. H. R. Buller has made to this subject in his six volumes of "Researches on Fungi". Dr. Ingold's own publications have so far dealt only with fungi, but following up this interesting subject he has examined critically the spore discharge of cryptogamic land plants as a whole, and the present volume deals with the Bryophyta and Pteridophyta as well as the Fungi. It is perhaps natural considering the inception of his investigations that his latter group of plants receives preferential treatment, but we must remember also that the methods of spore liberation among fungi are more varied.

Reviewing these seriatim, the author deals with the water-squirting mechanism of the Ascomycetes and other fungi, with the discharge due to rounding-off of turgid cells, with the catapult mechanism of Sphærobolus and with the drop-excretion process of basidiospore discharge. The mechanism of this latter process is not as yet fully explained. Prof. Buller has stated that "it may be that the force of surface tension is used in some way to effect discharge". Dr. Ingold gives a very careful consideration to this suggestion and from his calculations concludes that there appears to be sufficient surface energy to discharge the spore: but that it is not easy to see how this energy could be mobilized to bring about the discharge. A final solution of the problem, he thinks, must be sought