beam was examined on a photographic plate. It was found that the untreated specimen gave no definite reflection. In the case of the annealed specimen, however, spots were observed on the plate indicating that there were now present in the metal, crystals big enough to reflect quite an appreciable portion of the beam in definite directions. The same results were observed whether the surfaces were highly polished or badly tarnished.

On passing beams of X-rays through various metallic crystals, *e.g.* antimony, zinc, aluminium alloy (50 per cent. Al and 50 per cent. Cu), Laue spots were observed on the photographic plates. The spots

obtained on transmission through an antimony crystal are shown in the adjoining photograph. Owing, however, to the difficulty of procuring individual crystals of the metals, symmetrical Laue patterns have not yet been obtained. The experiments, however, show that this method of investigating metallic crystals may prove very helpful to the metallurgist.

E. A. OWEN.
G. G. BLAKE.

Teddington, February 9.

The Magneton and Planck's Constant.

THE relation between the magneton and Planck's constant is even more intimate than Dr. Allen's remarks (NATURE February 5), and his numerical illustration would suggest.

Using the notation employed by Dr. Allen, an electron (charge e, mass m) moving in a circular orbit (radius a) with angular velocity ω would have angular momentum $ma^2\omega$, and magnetic moment $\frac{1}{2}ea^2\omega$. On Dr. Bohr's hypothesis the angular momentum is related to Planck's constant h by the relation $ma^2\omega = h/2\pi$, and the magnetic moment becomes $e/m\ h/4\pi$, as Dr. Allen indicates.

The value of the magnetic moment per atom gram is $n\frac{e}{m}\frac{h}{4\pi}\frac{R}{k}$, where n is the number of such electrons per atom, and R and k the constants of the gas theory, so that R/k is the ratio of the atom gram to the atom.

Taking $\frac{e}{m} = 1{\cdot}772\ 10^7$

$\frac{ch}{k} = 1{\cdot}437$ (from radiation measurements)

$R = 8{\cdot}316\ 10^7$,

we have the magnetic moment per atom gram $= n\ 5617{\cdot}1$. But the magnetic moment per atom gram, as given by Weiss ("Idées Modernes sur la Constitution de la Matière," p. 334), is 1123·5, so that the number of such electrons in five atoms is equal to the number of magnetons per atom, as defined by Weiss, with the accuracy of Weiss's measurements and that of the constants above.

If instead of Bohr's hypothesis, the alternate one, that the angular momentum is equal to h/π, be employed, the five is replaced by ten. This seems to indicate that, in the magnetic materials, there is a unit of five (or ten) atoms, which has a constant number of magnetons.

The above results were stated by the writer in the discussion on radiation at the British Association, Birmingham, 1913.

S. D. CHALMERS.

The Northampton Institute, Clerkenwell, E.C., February 7.

Zonal Structure in Colloids.

IF Mr. George Abbott (NATURE, January 29, p. 607) will refer to the paper by Prof. J. W. Gregory and myself on eozoonal structure in the ejected blocks of metamorphosed limestones of Monte Sommá and Vesuvius he will find that twenty years ago I explained the mechanism of zonal structure, and showed it to be of osmotic origin in that and other cases. This has been amply confirmed by further investigation into illustrations of my "osmotic theory" of metamorphism, and, although paid little attention to by my own countrymen, is amply credited by the recent publications of Liesegang and Kurd Endell.

Amongst several of my papers will be found references to concentric laminated structure in such objects as spherulites, oolites, pisolites, calculi, &c. This I would attribute to zones of chemical exhaustion or surplus, which, in the end, is very nearly related to chemical exhaustion or surplus in osmotic interchange.

H. J. JOHNSTON-LAVIS.

Beaulieu-sur-Mer (A.M.), France, February 1.

DR. JOHNSTON-LAVIS's letter is indeed welcome; it confirms my own impression that English geologists have neglected concretionary processes. During my fifteen years of observation of the Fulwell beds no one ever suggested osmosis to me before Prof. S. Leduc. Even the authorities of the British Museum, South Kensington, whilst accepting a large number of my best specimens—some of them I cannot replace—have since repeatedly refused to give them the benefit of a modern classification, because none could be "recognised."

Few persons realise the great "experiment" made by nature at Sunderland, where there are two square miles of limestone, 130 ft. thick, associated with 70 ft. of the so-called marl beds. All the limestone shows magnificently the unique concretionary structure such as is unknown elsewhere in England, and, possibly, in the world.

The osmotic influence, or "osmotic interchange," as Prof. Johnson-Lavis calls it (Prof. Küster, of Bonn, in a recent letter to me says, "rhythmical precipitation, not osmosis") has operated in, and through, all the 130 ft. of rock, whilst the forces of crystallisation must have been subsequent and partial.

The change apparently took place after the strata had become solid enough for the formation of ordinary joints, the structure being conspicuous in starting from joints and bedding planes, whilst the pattern is very seldom seen to cross them. Pisolites and spherulites are, of course, common.

GEORGE ABBOTT.

Rusthall Park, Tunbridge Wells, February 9.

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