magnetic forces in determining crystalline structure, magne-crystallic action, and chemical combination in non-ionised media is apparent. It is interesting to note that Pascal (1910) showed that in organic compounds, all of which are diamagnetic, the molecular susceptibility is (apart from certain peculiarities of structure common to certain types of compounds) equal to the sum of the atomic susceptibilities of the component atoms. This is not true of ionised compounds, such as metallic salts, where the coupling between the atoms is probably of an electrostatic nature.

Further developments of the magneton theory were made by Parson (1915), who identified the electromagnetic coupling between pairs of magnetic doublets with the force of chemical combination. The magneton, or anchor ring electron, has been applied by Allen (1920) to interpret the phenomena of optical activity and optical isomerism. In connexion with the magnitude of the local magnetic field, namely, 10^7 gauss, it is interesting to note that Allen's calculations give a value 10^8 gauss at a distance from the anchor ring equal to its radius.

A number of attempts to obtain a quantum theory of magnetism have been made in recent years by Oosterhuis, Keesom, Gans, Reiche, and others. These are based on the assumption that the molecules are endowed with quantised molecular rotations, but the theory of Gans is the only one to take account of molecular interactions.

In connexion with these views the theory of Bohr and Sommerfeld must be considered. Though this has proved so successful in the interpretation of the fine structure of spectral lines, it does not appear at all obvious how the open elliptical orbits of this theory can give the uniquely balanced systems required to explain diamagnetism, nor does it give a picture of the directed forces which are responsible for crystal lattices. These considerations suggest that the atom must have a static structure. Perhaps the electron itself is quantised, the motion of its parts being highly localised compared with atomic dimensions. The electrons in an atom may be distributed on spherical or ellipsoidal surfaces, and the passage from one surface to another determine the emission of a definite amount of radiation of a certain frequency.

Quite recently Whittaker (1922) has published a new quantum mechanism of the atom based upon the existence of a number of atomic magnetic doublets. If an electron collides with this system the collision is perfectly elastic if the velocity of the electron is less than a certain amount. If the velocity exceeds this amount the electron passes through the magnetic system and hands over to the latter a definite quantum of energy which is identified as Planck's quantum. The derivation of the Balmer series can be obtained from this conception; it may later be found equally effective in interpreting the fine structure of spectral lines. Allen has replaced the particular magnetic structure postulated by Whittaker by a pair of ring electrons, thus identifying Whittaker's model more closely with Langmuir's cubical atom. The atomic structure is dynamical locally but is essentially static at ranges comparable with molecular dimensions. The static structure is required to account for crystalline and magnetic properties of matter in the non-radiating state. Recent experiments by the writer (1922) indicate that the occlusion of hydrogen by palladium produces a system the electronic configuration of which is similar to that of silver, and the fall in paramagnetism of the palladium is consistent with this view, silver being diamagnetic. Manganese which has been fused in an atmosphere of hydrogen is ferro-magnetic, although pure manganese is paramagnetic. Iron which has been fused in hydrogen has a higher coercive force than ordinary iron (like cobalt). These experiments indicate that when hydrogen is occluded in one of these elements an electronic system is produced corresponding to an element the atomic number of which is one higher than that of the element occluding the hydrogen. The suggestion is that the hydrogen electron, in such systems, enters into the outer shell of electrons of the metallic atom.

A static model, consistent of course with a highly localised dynamical model, such as the one advocated above, seems to be the only satisfactory interpretation of these results.

Obituary.

Prof. Oscar Hertwig.

THE death of Oscar Hertwig, formerly professor of anatomy in the University of Berlin and director of its Anatomical-Biological Institute, removes from the scene one of the chief leaders in morphological science. He formed a link in that chain of illustrious men including Johannes Müller, Gegenbaur, Fürbringer, and Gaupp, which has demonstrated how fully Germany has realised the importance of entrusting its great chairs of anatomy to men who are anatomists in the broadest sense of the word, leaders in vertebrate morphology and not merely experts in the details of anthropotomy.

Hertwig was most widely known through his series of admirable text-books. His "Lehrbuch der Entwicklungsgeschichte des Menschen und der Wirbeltiere" made its appearance in 1886 and has passed through numerous editions, both in its extended and in its condensed form ("Elemente," 3rd Edition, 1920). "Die Zelle und die Gewebe," first published in 1893, and known in its later editions as the "Allgemeine Biologie," is still widely used as a most admirable text-book of general biology on a cytological basis. During the years 1901–6 Hertwig brought out the various instalments of that wonderful encyclopædia which bears the characteristically German title "Handbuch der Entwicklungslehre der Wirbeltiere," edited and in parts written by himself. While it is, perhaps, permissible to hope that the appearance of this colossal work marks the approaching end of what may be called the encyclopædic age of biology, in which real progress has become more and more impeded and slowed down by the accumulation of minute details, there can be no question regard-

ing the value and utility of Hertwig's great "handbook."

Hertwig, a laboratory worker rather than a field naturalist, had no belief in "das schon morsch gewordene Lehrgebäude des Darwinismus," and to this fact we owe the last of his larger text-books—the useful and interesting, if not wholly convincing, "Das Werden der Organismen," first published in 1916 and now in its third edition.

Oscar Hertwig's really great, indeed epoch-making, contributions to the development of biological science are to be found, however, not in his text-books, but in a comparatively small group of original investigations, some of them carried out in co-operation with his brother Richard, which are of the most fundamental importance. It was in 1875 that Hertwig, forestalling van Beneden by a few months, showed for the first time, by his studies upon sea-urchin eggs, what was the real nature of the fertilisation of the animal egg—that the process consisted essentially of the fusion between the nucleus of the egg and the nucleus of one single spermatozoon. In 1878 there appeared the monograph by the brothers Hertwig upon the sense organs and nervous system of the medusæ—a work published before its time and perhaps destined to fill its rôle more completely in the future with a fuller recognition of the fact that the most fundamental function of the nervous system is to preserve intact the organic continuity in the animal body throughout its evolutionary increase in bulk.

In the early eighties of last century, Oscar and Richard Hertwig, stimulated by the work of English morphologists — Huxley, Lankester, and Balfour — turned themselves to the investigation of the foundations of the germ-layer theory, clearing up the muddle which had resulted from the non-recognition of what we now know by Hertwig's name, mesenchyme, and corroborating and amplifying Lankester's conception of the enterocœlic nature of the cœlom.

In 1890 Oscar Hertwig published his comparison of "Egg- and Sperm-formation in Ascaris," in which he worked out in minute detail the parallelism in gametogenesis in the two sexes, and cleared up the mystery of the "polar bodies," long known as characteristic of the unfertilised animal egg. Hertwig showed that male and female gametes are alike formed in sets of four, but that in the female sex three of each four degenerate, the three degenerate eggs being the polar bodies.

The last of Hertwig's works that demands mention is his study of those extraordinary malformations of vertebrate embryos to which he applied the name "spina bifida." In these the body of the embryo is divided into two halves by a longitudinal cleft traversing the notochord and the greater part of the central nervous system, and yet this seemingly irreparable injury proves no insuperable barrier to continued development. In many cases the cleft closes, the two halves unite and a perfectly normal individual results. Hertwig correlated these monstrosities with a hypothetical evolutionary stage in which the neural surface of the ancestral vertebrate was traversed by a slit-like primitive mouth, and to-day this is still the only working hypothesis at our disposal to explain a very extraordinary phenomenon.

It must not be imagined that Hertwig's activities were limited to such fields as are indicated by the various works to which allusion has been made. He interested himself in the social questions of the day, and the very last of his publications that has come into the writer's hands is "Der Staat als Organismus" (1922), with a trenchant criticism of some of those forms of extremism that are so rife at the present time.

Mr. A. Trevor-Battye.

Mr. A. Trevor-Battye, who died at Las Palmas on December 20, was an accomplished naturalist and Arctic traveller. The second son of the Rev. W. Wilberforce Battye, he was born in 1855 and adopted in 1890 the additional surname of Trevor on succeeding to certain estates that had fallen to his father. After leaving Oxford, Mr. Trevor-Battye indulged his taste for natural history in extensive travels in North America, Africa, the Himalayas, and Arctic Europe. In 1894, in the yacht *Saxon*, he visited the little known island of Kolguev, in the Barents Sea, with the object of devoting the summer to the study of its bird life. The *Saxon*, on returning from a cruise to Novaya Zemlya, missed Mr. Trevor-Battye through inability to reach the east coast, and returned to England without him or his companion, Mr. Hyland. The two Englishmen joined a party of wandering Samoyedes and made good their retreat to the mainland by sledge and boat. This was a fruitful expedition and completed the exploration of Kolguev.

In 1896 Mr. Trevor-Battye returned to the Arctic regions, accompanying Sir Martin Conway as naturalist on his expedition to Spitsbergen. Mr. Trevor-Battye made explorations around Dickson Bay and, with Prof. Garwood, climbed Hornsunds Tind. A few years later he visited Crete and made valuable contributions to the knowledge of its natural history.

Mr. Trevor-Battye was editor of natural history in the "Victoria History of the Counties of England," and of Lord Lilford's book on British birds. His own works included "Icebound on Kolguev" (1895); "A Northern Highway of the Tsar" (1897); and "Camping in Crete" (1913). "Crete: its scenery and natural features" was a recent contribution to the *Geographical Journal* (September 1919).

Dr. Fridolin Krasser.

A few weeks ago Dr. Fridolin Krasser was found dead in his laboratory at the Deutsche Technische Hochschule at Prague, where for several years he had occupied the chair of botany. He was widely known as a palæobotanist who had devoted himself to the investigation of Mesozoic floras, more especially to the study of the large collections of Upper Triassic plants from the well-known Lunz beds in the Hof Museum of Vienna. In 1887, Dr. Krasser published a note on heterophylly inspired by the work of Baron Ettingshausen, with whom he was closely associated. In 1891 he wrote on the Rhætic floras of Persia; a few years later he turned his attention to the Cretaceous plants of Moravia, and in 1900 and 1905 made some interesting contributions to our knowledge of Palæozoic and Mesozoic floras of the Far East.