OBITUARY NOTICE.

JOSEPH ACHILLE LE BEL.*

BORN JANUARY 21ST, 1847; DIED AUGUST 6TH, 1930.

THE death of Joseph Achille Le Bel, which occurred in Paris on Aug. 6, removes a veteran who had been closely associated with the rapid development of organic chemistry during the latter part of the last century. Le Bel was born at Pechelbronn, Alsace, on Jan. 21, 1847, and was a nephew of Boussingault, the agricultural chemist. He was a student at the École Polytechnique from 1865 to 1867 and became successively assistant to Balard, the discoverer of bromine, at the Collège de France, and to Würtz, at the École de Médecine, in Paris. For some time he was in charge of the petroleum workings at Pechelbronn, in which his uncle was interested; he became and remained an ardent partisan of Mendeléeff's view that the petroleum deposits result from the action of steam on metallic carbides at volcanic temperatures.

Le Bel holds an honoured position in the history of science as one of those eminent French natural philosophers who discovered and worked out the earlier consequences of optical rotatory power. Arago observed in 1811 that the plane of polarisation of a beam of polarised light is deflected by passage through a plate of quartz cut perpendicular to the optic axis; in 1815 Biot found that certain organic liquids, such as turpentine, are also optically active in the same sense. In the 'fifties and 'sixties, Pasteur concluded from his classical investigation of the tartaric acids that the optical rotatory power of aqueous solutions of these organic compounds arises from asymmetry of their molecular configurations. No progress was made, however, in the problem of ascertaining the definite arrangement in three-dimensional space of the atomic components of optically active molecules, called for by Pasteur's fundamental conclusion, until the doctrine of the asymmetric carbon atom was enunciated.

The theory of the asymmetric carbon atom was put forward independently and practically simultaneously by van 't Hoff and Le Bel in 1874; after a brief period of discussion, accompanied by a certain amount of lively ridicule, the theory became universally accepted and to-day forms the foundation of the vast subject of the

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Joseph Achille Le Bel.

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stereochemistry of carbon compounds. The theory was evolved in a somewhat different fashion by its two authors. Van 't Hoff proceeded from the assumption that, in such a molecule as that of methane, CH_4, the four valency directions of the carbon atom are directed from a centre, representing the carbon atom, towards the apices of a regular circumscribing tetrahedron, the four hydrogen atoms being centred at those apices. In the substitution derivatives of methane of the types, CX_3Y, CX_2YZ, X, Y and Z being univalent radicles, no isomerism should exist if the four radicles lie at the apices of the tetrahedron as foreshadowed by the theory; when all four radicles attached to the central carbon are different, as in the type CWXYZ, two isomerides should exist, the space configuration of one being the mirror image of that of the other. A carbon atom so attached to four different radicles is termed asymmetric, and, in accordance with the conclusion of van 't Hoff and Le Bel, all substances which contain one asymmetric carbon atom in the molecule have been found to exist in two mirror image, or enantiomorphously related, configurations, of arithmetically equal but algebraically opposite rotatory powers.

Le Bel arrived at the theory in a somewhat different manner. He discussed the mode in which the four univalent radicles attached to a quadrivalent carbon should arrange themselves as a pure question of equilibrium, and hence arrived at the tetrahedral environment of the central carbon atom with the same consequences, as regards asymmetry, as those of van 't Hoff. It is not yet settled whether van 't Hoff's view, that the carbon atom carries four valency directions directed towards the four apices of a circumscribed regular tetrahedron, is preferable to that of Le Bel, but the tendency of modern organic chemistry is certainly towards the Le Bel implication that the four carbon valency directions are not so fixed. Probably, however, both men were making in 1874 an incomplete statement of the same thing; although more than half a century has elapsed, it is not yet possible to state the theory of the asymmetric carbon atom in more definite and explicit terms than was done at that date.

Le Bel was the first to separate an optically active component from the synthetic mixture of the two mirror image components of a compound containing an asymmetric carbon atom; he did this in most cases by taking advantage of the selective destructive action of lower organisms on the laevo- and dextro-isomerides. He was also the first to show that when the asymmetric carbon atom of an optically active substance of the type, CWXYZ, becomes symmetric by conversion into the allied compound, CX_2YZ, the optical activity disappears.

Later, Le Bel extended his stereochemical conceptions to quinquevalent nitrogen compounds and announced in 1891 that he had been able to obtain optically active methylethylpropylisobutylammonium salts; this observation could not be confirmed by others and is no doubt mistaken. The laboratory technique for dealing with such complex substances had not then been sufficiently worked out, and it was not until 1899 that the first optically active substituted ammonium salts containing an asymmetric quinquevalent nitrogen atom, but no asymmetric carbon atom, were first prepared.

Le Bel did not publish a great amount of experimental work, probably because he held no academic post and so found few collaborators; his writings cover, however, a wide range of subjects and are permeated by a quite uncommon philosophic spirit. He was an individualist and mixed little with his scientific colleagues; he was intolerant of officialdom in any of its aspects, and was wont to express his contempt of bureaucracy with some vigour. His originality of thought, his outspokenness, and his unconventionality, indeed bohemianism, made him somewhat difficult of access, but in congenial society he was a delightful companion, full of knowledge of the world and sparkling with anecdote and caustic wit. He maintained his interest in science to the end, and, so late as April last, offered a money prize for the rediscovery of a microscopic green alga, found and lost by him, which had the power of converting atmospheric nitrogen into ammonia.

Le Bel was president of the French Chemical Society in 1892; he was a Commander of the Legion of Honour and a member of the Paris Academy of Sciences. He was elected an honorary fellow of the Chemical Society in 1908 and a foreign member of the Royal Society in 1911; in 1893 both he and van 't Hoff became Davy medallists of the Royal Society.

W. J. POPE.