AN ATTEMPT TOWARDS A CHEMICAL CONCEPTION OF THE ETHER

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BY

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CHEMICAL CONCEPTION OF THE ETHER

In his 'Dictionnaire Complet,' P. Larousse defines the ether as 'an imponderable elastic fluid, filling space and forming the source of light, heat, electricity, etc.' This is laconic, but sufficient to raise some misgivings in the mind of a thoughtful man of science. He is obliged to admit, in the ether, the properties of a substance (fluid), while at the same time, in order to explain in some way the transmission of energy through space by its motion, the ether is assumed to be an all-pervading 'medium.' Moreover, in order to explain the phenomena of light, electricity, and even gravity, this medium is supposed to undergo various disturbances (perturbations) and changes in its structure (deformation), like those observed in solids, liquids, and gases. If the fluid medium permeates everything and everywhere, it cannot be said to have weight,

just as the ponderability of air could not be recognised before the invention of the air-pump. Yet the ether must have weight, because, since the days of Galileo and Newton, the quality of gravitation or of weight forms a primary property of substances. From various considerations Lord Kelvin came to the conclusion that a cubic metre of ether should weigh about and not less than 0·000,000,000,000,000,1 grm., while a cubic metre of the lightest gas, hydrogen, weighs 90 grams under the atmospheric pressure. The above-mentioned misgivings of the thoughtful scientist begin in his most plausible endeavours to ascribe a certain weight or mass to the ether, for the question naturally arises: At what pressure and temperature will this weight be proper to ether? For at infinitely small pressures or exceedingly high temperatures steam or hydrogen would have as small a density as that given by Lord Kelvin for the ether. And as regards the density of the ether in interplanetary space, neither steam nor hydrogen would have a measurable density in these regions, notwithstanding the extreme cold, for the pressure would be infinitely small. Theoretically, space may be supposed to be filled with such rarefied residues of vapours and gases. And this view even

corresponds with Kant's and Laplace's and other theories, which strive to explain the unity of plan in the creation of the heavenly bodies. It also accounts for the uniformity of the chemical composition of the entire universe, demonstrated by the spectroscope, as it gives a means, through the agency of such ether, of interchange between the heavenly bodies. One of the objects of an investigation into the elasticity or compressibility of gases under low pressure, undertaken by me in the seventies, was to trace, as far as the then existing methods of measuring low pressures permitted, the changes proceeding in gases under low pressures. The discrepancies from Boyle's law observed (by me and M. Kirpitchnikoff, 1874) for all gases, and subsequently confirmed by Ramsay and others (although still denied by some investigators), indicate a certain uniformity in the behaviour of all gases and a tendency in them towards a certain limiting expansion at low pressures, just as there is a limit to compression (liquefaction and the critical state). But determinations of very low pressures are accompanied by insurmountable difficulties. It proved practically impossible to measure, with any degree of accuracy, pressures under tenths of a millimetre of mercury, and this is far

too large a figure for such rarefied media as are supposed to exist at an elevation of even 50 kilometres above the sea level. Hence the conception of the ether as a highly rarefied atmospheric gas cannot so far be subjected to experimental investigation and measurement, which alone can direct the mind in the right direction and lead to reliable results.

But, beyond this, the conception of the ether as a limiting state of expansion of vapours and gases cannot sustain even the most elementary analysis, for ether cannot be understood otherwise than as an all-pervading ubiquitous substance, and this is not the property of either gases or vapours. Both the latter are liquefiable under pressure, and cannot be said to permeate all substances, although they are widely distributed in nature, even in meteorites. Moreover—and this is the most important—they vary infinitely in their chemical nature and in their relations to other substances, while the ether, as far as is known, is invariable. Owing to the variety of their chemical properties, all vapours and gases should react differently on the bodies which they permeate if they were components of the ether.

Before proceeding further, I think it necessary to justify the chemical views here and