

the universal tendency in nature towards a dissipation of energy, by saying, "The entropy of the world is always on the increase."

For about twenty years after these conceptions had been introduced into scientific language and reasoning, mathematicians and physicists were mainly occupied in defining more clearly this hidden quantity, and in defending what was called the second law of thermodynamics against misconceptions and attacks. In 1875 Lord Rayleigh could still say,¹ "The second law of thermodynamics and the theory of dissipation founded upon it has been for some years a favourite subject with mathematical physicists, but has not hitherto received full recognition from engineers and chemists, nor from the scientific public. And yet the question under what circumstances it is possible to obtain work from heat is of the first importance. Merely to know that when work is done by means of heat, a so-called equivalent of heat disappears, is a very small part of what it concerns us to recognise."

Whilst these words correctly describe the general attitude of the scientific public towards this important discovery, two men had already made a beginning in the direction indicated—Horstmann² in Germany, and

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¹ 'Proceedings of the Royal Institution,' vol. vii. p. 386.

² Prof. Ostwald in the historical section of his 'Verwandtschaftslehre' ('Allg. Chemie,' 2nd ed., vol. ii. part 2, p. 111, &c.), Helm in 'Energetik' (p. 141, &c.), and Duhem in his 'Traité de Mécanique chimique' (1897, vol. i. p. 84, &c.) all do full justice to the long-unrecognised labours of Horstmann,

which began in the year 1869 and were continued in Liebig's 'Annalen' in various communications during the early 'seventies, not without undergoing violent attacks from representatives of the older conceptions. Ever since James Thomson's celebrated prediction (see above, p. 126), physicists had recognised the importance of thermo-dynamical considerations,