

the part of some of the great laboratories of Paris or of Germany, in turning out a large number of well-trained experimentalists. Davy may be said to have educated Faraday, though he was suspected of having become jealous of him, and Faraday declared he received only one valuable suggestion from any member of his audience during the whole course of his lecturing. It is the strongly marked individuality of all these great men, expressed in their persons, their lives, and their works, rather than the character of the institution itself, which has given celebrity and historical importance to the Royal Institution. John Dalton's¹ position in the Literary and Philosophical Society of Manchester was similar to that of Davy and Faraday in the Royal Institution; and as Faraday can in some sense be called a pupil of Davy, so can Prescott Joule² be termed a pupil of Dalton, whom

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¹ See note, p. 245.

² James Prescott Joule (1818-89), a native of Salford, "received from Dalton his first inducement to undertake the work of an original scientific investigator." He was one of the first who tried to measure electrical action in terms of the units of well-known mechanical or chemical changes. His publications began in 1840. Weber's 'Electrodynamische Maasbestimmungen,' that great monument of exact measurement, was published in 1846. Mayer's first publication, containing a calculation of the mechanical equivalent of heat, bears the date 1842. But the great publication of Gauss, in which he measures magnetic action in ordinary mechanical (or absolute) units, dates from 1832: 'Intensitas vis magneticæ terrestris ad mensuram absolutam revocata' (Comm. Societ., Götting., 1832, &c.)

Joule in 1843 published the first of his accurate determinations of what is termed in physical science "J" or "Joule's equivalent of heat." He read successively papers on this subject before the meetings of the British Association, first at Cork (1843), giving the constant "J" as 838, then as 770, then as 890 in 1845 (Brit. Assoc. at Cambridge), lastly at Oxford (1847) as 781.5. From this meeting dates the acquaintance and scientific co-operation of Joule and Thomson (Lord Kelvin) and the gradual recognition of the importance of the subject by other men of science (see Thomson's address on Joule, 1893, in 'Popular Lectures and Addresses,' vol. ii. p. 558 *sqq.*) Helmholtz's memoir, "Ueber die Erhaltung der Kraft," which was theoretical—as Joule's were experimental—dates also from 1847.