

The principal object of this paper is to prove that most combustible bodies undergo a kind of combustion, attended with light and heat, at a temperature considerably below that usually assigned as their point of ignition. This fact has been already noticed with regard to phosphorus and sulphur; and the pale blue flame produced in the vapour of ether by a hot palladium or platina wire, before the wire itself becomes vividly ignited, is another instance of the same general law, which the author finds applicable to all compound, and a few of the simple inflammable bodies. Of these he gives a variety of examples among oleaginous, resinous, and carbonaceous products, both animal and vegetable, which, when thrown on a hot iron, exhibit a pale and faintly luminous flame. Those on the other hand which are very volatile, such as camphor, the essential oils, ether and alcohol, rise in vapour before they reach the temperature necessary for their combustion; but they may be made to exhibit the same phenomena, by directing their vapour against a body heated below redness. The contact of pure oxygen gas immediately heightens the intensity of the light and heat evolved on these occasions, and excites them into a more decided and vivid combustion.

The author next adverts to the nature of the products of this low form of combustion, which, in organic substances, appear to him to form an intermediate link between those of open combustion, and those of fermentation and putrefaction. He considers the phenomena he has described as confirming the truth of a law he formerly announced, namely, that "the evolution of heat during chemical change is, *ceteris paribus*, proportionate to the degree of change from isolation, or weak combination, towards firm and simple union." He thinks they will afford an explanation of many cases of spontaneous combustion, which have hitherto been involved in mystery; such as that of porous combustible matters, as oily cotton, tow, or wool, when accumulated in considerable quantities, in places protected from cooling, or where air has limited access; and also of heaps of coal or charcoal, of pyrophori and pyrites; and the same principles may perhaps also account for the phenomena of the spontaneous combustion of the human body which are on record.

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May 8th, 1834.

FRANCIS BAILY, Esq., Vice-President, in the Chair.

A paper was read, entitled, "On the Connexion between Refracted and Diffracted Light." By Paul Cooper, Esq. Communicated by J. G. Children, Esq., Sec. R.S.

The purport of the present paper, as stated by the author, is to connect the phenomena of the dispersion of light arising from refraction, with that consequent upon diffraction, by showing, 1st, "that white refracted light is formed by the superposition of fringes of colours, or rays of light uniformly refracted, which compensate each other in succession; 2nd, that diffracted white light is formed by the superpo-

sition of fringes which are not uniformly refracted, but which recede from it so gradually, as not to prevent the same mutual compensation, although it is distinguished by other appearances ; and 3rd, that the purity of the colour of the light, in both cases, depends upon its continuity, any interruption of which, although the different portions into which it may be separated are white at the moment the division takes place, produces colours in its further progress, because each portion carries with it the difference of direction required for their development."

A paper was also read, entitled, "Observations on the Reciprocal Influence which Magnetic Needles exercise over each other, when placed at a given distance within their respective Spheres of Action, at different positions on the Earth ; with Tables of numerical Results obtained at separate Stations. Also a method of discovering where certain local influences are acting on the Needle, from which may be obtained a proportional correction to be applied to Magnetic Observations in general." By Edward J. Johnson, Esq., Commander R.N. Communicated by Francis Beaufort, Esq., Capt. R.N., F.R.S.

The author, considering it probable that two or more magnetic needles freely suspended at a certain distance in given positions with respect to each other, would develop certain proportionate deflections determined by their position on the earth, made a set of experiments, with a few common compass needles, at Yarmouth, London, and Clifton, which so far confirmed the truth of his conjecture, as to induce him to fix on stations at a greater distance from one another, and to multiply his observations ; ascertaining, from time to time, that the magnetic powers of his apparatus had undergone no material change. The results of these observations are given in a tabular form.

The author conceives that comparative observations of the amount of deflection produced by one magnet on another, placed in various situations, relative to the meridian, on an horizontal plane, will afford the means of determining the peculiar local influences of the particular situation in which the experiment is made, as distinguished from the general magnetic influence ; because the former will act unequally on each magnet, while the latter acts equally on all.