Light and Sight.

In a recent number of Nature (Jan. 21, p. 95), Sir John Parsons, referring to the duplicity theory of vision, says without qualification that the "rods are responsible for scotopic, the cones chiefly for photopic vision," though he later refers to 'difficulties' in this formulation.

Current theories of colour vision may be divided into two groups: Young-Helmholtz (three-colour processes, all positive) and Hering (two-colour processes, with positive and negative conditions, and white). The first logically leads to a postulate of three photopic light-sensitive pigments, and a fourth for scotopic vision.[1] Following this scheme, it is logical to assign the four pigments each to a separate series of organs, and to assign scotopic vision to the rods, which alone have been recognised as possessing the scotopic pigment. The photopic pigments should be present in such minute amounts as to be undetectable with our present crude methods.

The Hering theory, with its negative as well as positive colour-processes and its double maximum for the red process, leads as naturally to some physical (refraction, interference or diffraction) separation of the colours, and a single, indifferent photopic pigment is sufficient (the same which any theory seems to demand for the peripheral retina). In this case there is no obvious reason why the two pigments, photopic and scotopic, should coincide in distribution with the presence or absence of the special structures leading to colour separation, and Sir John Parsons's statement is no longer obvious.

In fact, the existence of an acute colour sense in the middle range of adaptation[2] (that of ordinary lamp-light), where the rapidity of adaptation shows that the scotopic pigment is functioning, seems incapable of explanation unless this independence is assumed. Under the Helmholtz theory, the colour-processes, being dependent quantitatively on the minute surviving amount of photopic pigment, should be completely overshadowed by the ten or a hundred times greater activity of the 'rods.'

I have recently worked out in some detail a hypothetical separation of the colour-sorting and photosensitive processes on this basis of independence, with a physical basis (interference) for one and a chemical (photosensitive pigment) for the other (*American Journal of Psychology*, **40**, 1-25; 1928).

As to the foveal 'cones,' it should be noted that they are really organs of intermediate character, at least in the monkey and man, and could just as well be interpreted as modified *rods*.

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The 'Dative' Chemical Bond.

Wave mechanics notwithstanding, the electronic conception of valence in chemistry is serving a useful purpose. It is true that we know little in regard to what we symbolise by a shared pair of electrons, but even less was ever known of the inner meaning of the single bond of organic chemistry, although nobody would deny that the conception of such a bond has been a useful one.

In recent years, a clear distinction has been drawn between two types of co-valence involving a pair of electrons shared by the atoms A and B. In the first type, 'normal' co-valence, each of the two atoms contributes one of the two electrons. In the second type, one of the two atoms, say A, contributes both electrons. Since B gains a share in the pair, it gains in negative charge; while A loses in negative or gains in positive charge. Because of this separation of charges, the molecule is rendered polar.

Various names have been suggested for the second type of co-valence here described. So long as the conception remains a useful one, by all means let us have a good name for it. One of the earliest names, suggested in 1921 by Perkins in the *Philippine Journal of Science*, was a 'borrowing direct union.' Lowry proposed the names 'mixed' or 'ionised' double bonds, because the union partook of the nature of electro-valence as well as of co-valence. These names have been adversely criticised by Porter, Rankine, and others. Sugden in 1925 proposed the term 'semipolar double bond,' which is perhaps unduly polysyllabic. Realising that none of these names is entirely satisfactory, Sidgwick called this type of bond the 'co-ordinate' link or bond. But this is apt to lead to confusion, in such a typical case, for example, as the following. In considering the compound $[Co\,Cl(NH_3)_5]Cl_2$, chemists now universally follow Werner's usage and speak of the chlorine and the five ammonia molecules within the square bracket as being co-ordinated with the central cobalt atom. But of these six co-ordinated entities, only five are attached by 'co-ordinate' links.

Adopting a useful terminology, Sidgwick has called the atom A above a 'donor' and the atom B an 'acceptor' atom. To this it cannot be objected that the names savour overmuch of electro-valence, where one electron is given and taken, for the second type of co-valence has indeed a close analogy to electro-valence, and this may rightly be indicated in the nomenclature. In consonance with this idea, I wish to suggest that the second type of co-valence bond described above be called a 'dative' bond or link. 'Dative' is a short word, and unspoiled by previous usage in chemistry.

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Luminescence of Mercurous Chloride of Standard Purity.

On studying the photochemical changes of a pure and dry mercurous chloride, prepared in a dark room, a greenish-white luminescence was observed when this was stirred by a dry glass rod. This phenomenon was noticed in glass, porcelain, and metallic crucibles for about five seconds, and it was not possible to produce it with the same rod again unless the rod was cleaned of its deposit of mercurous chloride powder. The luminescence was produced also for about the same length of time if the rod itself with its thin mercurous chloride cover was slightly rubbed with a dry cloth. The foregoing illumination of the sample has no effect on the duration and quality of the excited light.

The experiments so far made show that the dryness of the sample treated plays an important rôle in the intensity and the duration of the phenomenon described. On the other hand, one could not increase the duration of scintillation, although all traces of water and other impurities were most carefully excluded both in preparation of the chloride used and during the operation with it.

So far as could be proved, the phenomenon observed is not caused by electric charge produced by rubbing, nor is it a case of phosphorescence or crystalo-luminescence, since it is affected neither by a previous illumination nor by a perfect pulverising.

The details will be published elsewhere after the experiments have been completed.

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[1] It is necessary to assume for the peripheral retina either a fifth pigment or an equal mixture of the three colour pigments in the individual rods.

[2] I propose to call this middle range of adaptation 'mesopic.' Most experimental work is done within it, but may be reported either as 'photopic' or 'scotopic,' causing much confusion of interpretation.