The Classification of Coals

I HESITATED to answer the letter published in NATURE of June 1 from Prof. Bone because so long ago as the year 1918 he indicated to me with emphasis that he did not desire any co-operation between chemical and palæobotanical work on coal.

May I, however, point out that he incorrectly says that the terms vitrain, clarain and durain are "imported from France". They are words coined *de novo* by myself in my paper in the *Philosophical Transactions of the Royal Society* in 1919. They do not correspond to the popular 'bright' and 'dull' coal, but were originally diagnosed for ingredients recognised as containing materials with distinct physical properties, and different types of cokes.

That Prof. Bone does not adopt my nomenclature or care to see the differences perceivable to others is a matter for his own orientation about which argument is unsuitable. But he is surely ill-informed to imply that "outside the exclusive circle of the 'Coal Research Club' " these ingredients do not receive recognition. A complete bibliography of coal research since 1919 would show how widely they are adopted. He is briefly answered by the words of M. Duparque (secretary of the Geological Society du Nord), *not* a member of the Coal Research Club, who, writing in 1924 of the laminations in coal, cited the important works of Bertrand, Renault, Grand 'Eury, Wheeler, Seyler, Potonie, Zalessky and others and said: "De tous ces travaux, ceux de Madame Marie Stopes ont eu la plus grande influence sur la direction de toutes les recherches concernant la houille".

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Stationary Optical Paths

REFERRING to Dr. Karl Darrow's[1] article on quantum mechanics, Mr. T. Smith[2] has pointed out that optical paths are not (as Darrow repeats in his article) paths sometimes of maximum and sometimes of minimum time; but that the time is a minimum if the path does not include an image of an end point, and if the path includes an image then the time is neither a minimum nor a maximum. Smith has further elucidated this point in connexion with Darbyshire's[3] recent letter.

The close analogy so significant on wave mechanics between the principle of least action in classical mechanics and the principle of stationary time for optical paths (Fermat's principle) is well known. The principle of least action[4] states that the action is a true minimum, provided that in passing along the trajectory of the particle the final point is reached before the kinetic focus of the initial point. But when the kinetic focus of the initial point is reached before we arrive at the final point, the action is neither a maximum nor a minimum. The definition of the kinetic focus is akin to the definition of image given by Smith in his recent note. Thus we see that the relationship between Fermat's principle and that of least action is not fully exhibited unless we take into account for optical paths the facts emphasised by Smith and so often ignored in text-books on optics.

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[1] Darrow, "Reviews of Modern Physics", **6**, 23; 1934.
[2] Smith, NATURE, **133**, 830; 1934.
[3] Darbyshire, NATURE, **135**, 586; 1935.
[4] Whittaker, "Analytical Dynamics" (1927), Section 103.

Points from Foregoing Letters

FROM the amount of aluminium hydroxide adsorbed by kieselguhr (diatomaceous earth) and from the resulting electrokinetic potential (ζ) of the particles, as shown by their movement in an electric field, Prof. E. C. C. Baly and Mr. W. P. Pepper conclude that aluminium hydroxide is first adsorbed as a unimolecular layer giving a ζ-value of 75·4 millivolts. This layer is then able to adsorb a second molecular layer, resulting in a drop in the value of ζ to 61·2 mv.

Super-contraction of animal fibres has been induced artificially by various means. Dr. R. O. Hall describes a naturally occurring example of the phenomenon and proposes a tentative explanation in terms of the disulphide linkage of keratin.

Dr. A. K. Das gives results obtained by means of a continuously recording electrometer which was in action at Cambridge from February 14 until March 20. These photographic records appear to confirm Kolhörster's observations, made with Geiger-Müller counters, indicating an increase in the intensity of cosmic rays during the hours when the star Nova Herculis was at its greatest altitude.

Following upon the recently-published note in NATURE by Dr. Adair and Mr. Taylor, who had succeeded in obtaining seralbumin from normal human sera, Prof. Raul Wernicke now submits photomicrographs of crystals of human and guinea pig seralbumin obtained last year by Dr. Moisés Grinstein of Buenos Aires, and describes the method used in obtaining the crystalline preparations.

Having succeeded in extracting from various organs of the *Octopus* and other invertebrate marine animals a substance giving the physiological reaction of unstable choline esters, Dr. Z. M. Bacq infers, as C. F. A. Pantin did recently, that the rôle of acetylcholine in the nervous mechanism of invertebrates is similar to that in the higher animals.

Mr. H. Dam recently indicated the existence in hog liver fat, tomatoes, etc., of a new vitamin, K, which prevents a deficiency disease in chicken, leading to bleeding tendencies and other symptoms. H. J. Almquist and E. L. R. Stokstad point out that the new vitamin is also present in dehydrated alfalfa and in fish meal or rice bran that have been kept in a wet condition.

Prof. A. Bruce Macallum describes experiments indicating that certain extracts from the duodenum contain, in addition to the hormone which stimulates the secretion of insulin, a further component which is antagonistic to insulin.

The effect of unexpected stimuli in reducing or eliminating experimental deafness produced by loud 'pure' noises, and the fact that such deafness extends to the other ear even when it is not directly exposed to the noise, leads Mr. A. F. Rawdon-Smith to attribute the so-called auditory fatigue to an inhibition effect in the brain cortex rather than to a local effect in the ear.