LETTERS TO THE EDITOR

Prompt publication of brief reports of important discoveries in physics may be secured by addressing them to this department. Closing dates for this department are, for the first issue of the month, the twentieth of the preceding month; for the second issue, the fifth of the month. The Board of Editors does not hold itself responsible for the opinions expressed by the correspondents.

On the Velocity of Light

The determination of the velocity of light with the aid of mirrors furnishes some average between the velocities to and from the most remote mirror. This average may, of course, be a complicated function depending on various factors, although it seems universally assumed that the velocity either to or from the remote mirror is exactly equal to the average velocity. The recent anomalies observed by Pease and Pearson[1] in their experiments in California emphasize the need of a closer examination into these factors, among which is the structure of the light employed for such measurements.

All previous experiments have made use of light in which the incident ray and the reflected ray were essentially of the same kind, the difference consisting in the change in phase introduced on reflection. Because of this close relationship between the rays, I shall call them "related." Here, I wish to urge an experiment in which the rays are as unrelated in nature as possible and thus it is probable that the velocity obtained can be set equal to that of an unidirectional beam. The aim is to compare in a single measurement the average velocity furnished by such "unrelated" rays with the velocity of "related" rays. Should these velocities be found unequal, a greater discrimination in the definition of the velocity of light will be necessary. The possible repercussion on the theory of relativity which identifies the velocity of light with the fundamental[2] velocity of the Lorentz transformations would make the following experiment especially worth while.

A beam of light in the shape of a slit will pass through the apparatus (such as that of Foucault-Michelson) in the usual way but instead of being reflected at the distant mirror throughout its entire length, the image of the slit is to be reflected in one-half of its length at the mirror and the other half is to excite fluorescence of another color in an adjoining vessel. The comparison of the velocities consists in observing in what measure the fluorescent color is shifted with respect to the incident color in the return image.

Comments on the experiment: The time-lag in the fluorescence of numerous substances is so short that the image radiated back by the fluorescing medium will be practically as sharp as the one reflected by the mirror. The single bi-convex lens employed by Michelson in his early work may, for example, be replaced by two plane-convex lens so that one plane-convex lens can be situated close to the fluorescing material. A resonance lamp with its high efficiency may serve as the vessel adjoining the remote mirror. However, the incident and reflected rays under these conditions may not be as completely "independent" of each other as when the rays are of different wave-lengths. The time-lag of the fluorescence and the depth of penetration into the vessel, if the fluorescing medium be a transparent substance rather than a fluorescing surface, must of course be taken into account. Only such fluorescence need be used whose time-lag has been found (with the aid of the Abraham-Lemoine shutter for example) to be comparable with the time required by the mirror to rotate through the smallest detectable angular displacement and also it is to be very short as compared with the duration of the journey of the light. However, the latter errors may be minimized by carrying out the experiment with the fluorescing material at various distances from the rotating mirror.

The methods now available for constructing efficient fluorescing lamps would seem to make this experiment feasible without much further technical improvement. On the other hand, should the experiment confirm the general belief in the equality of the velocities, an experiment of this kind could determine the time-lag of various radiation processes.

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October 19, 1934.

[1] To be published soon in the Astrophysical Journal.
[2] A. S. Eddington, *The Mathematical Theory of Relativity*, p. 19, 1923.

Remarks on the Band Spectrum of Sulfur and the Statistics of the Sulfur Nucleus

A few years ago Naudé and Christy[1] examined the fine structure of five of the bands of diatomic sulfur in the near ultraviolet and made an analysis of them from which they calculated that in the normal state of the sulfur molecule the internuclear distance is 1.603A. If this result were correct it would appear that the sulfur molecule were very abnormal since a distance somewhat greater than 1.8A is predicted by several rules, including the covalent bond radii and an empirical rule of the author[2] by which internuclear distances can be calculated from vibrational frequencies.

Since no other deviation from these rules of this magnitude is known, it occurred to the writer to examine the data to determine whether the analysis of Naudé and Christy were unique. He soon came to the conclusion that it is not and, for several reasons, is probably incorrect. He noticed, for example, that their Δ_2F' values show certain peculiarities. They appear to be identical within experimental error for the bands 8–1 and 9–1, and also for 10–1[3] up to the point where this band runs into the head of 8–0. Now when the Naudé-Christy Δ_2F' values for 10–1 and 10–2 are plotted against K they fall on straight