Reflecting Power of Aluminised Surfaces

DURING the course of some recent work on the reflecting powers of certain metallic substances in the ultra-violet part of the spectrum, I have had the opportunity of testing the behaviour of aluminium (deposited on to a glass surface by the new evaporation method) and it was thought that the results obtained would be of sufficient interest to justify this note. The accompanying table gives the values

λ	Proportion reflected	λ	Proportion reflected
3610 A.	0·84	2265 A.	0·86
3404	0·83	2196	0·86
3261	0·91	2144	0·84
2981	0·90	1990	0·87
2749	0·90	1936	0·87
2573	0·89	1863	0·70
2313	0·91		

for radiation of normal incidence, and the spectrograms (Fig. 1) show the relative 'density' of the lines (*a*) when employing the spark alone, and (*b*) when the reflecting surface was used. From these it will be noticed how regular is the reflection throughout the entire ultra-violet spectrum, and that the reflecting power is unusually high for a metal even down to λ = 1863 A.

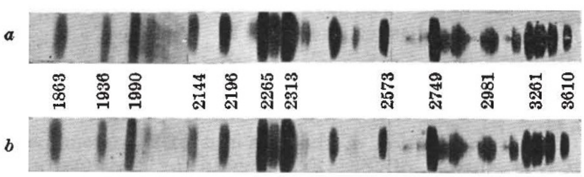

FIG. 1.

I wish to express my thanks for the co-operation of Mr. C. H. Walker of Messrs. Metropolitan-Vickers Electrical Co., Ltd., in producing the aluminised surface for the tests.

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Asymptotic Developments of Periodic Functions related to Periodical Physical Phenomena

IT is interesting to note that certain well-known results in electromagnetic radiation and wave mechanics may be deduced from general considerations regarding the nature of functions representing the solutions of differential equations of the field concerned.

Take, for example, the case of a field of electrons which may be regarded as singularities of the function representing the field. Suppose, as Ferrier has done, that $F(u)$ is a certain function (well determined) of relative velocities of any two electrons. If the movements are vibratory, $F(u)$ will be a periodic function with a maximum and a minimum. Such a function may be asymptotically developed. With given singularities, a differential equation may be easily found such that

$$W = H\nu$$

where W is the Einsteinian energy of the system and H is a function of Planck's constant h.

Again, developing asymptotically the solution ψ of Schrödinger's wave equation in the form

$$\psi \sim e^{\lambda s} - \left(v_0 + \frac{v_1}{\lambda} + \ . \ . \ . \right),$$

Birkhoff[1] has shown that an invariantive relation for arbitrary linear transformations of the field is obtained. This result is obtainable from the linearity of the developments. Again, the wave equation

$$\nabla^2 u = c^{-2}\, \partial^2 u / \partial t^2$$

may be treated with the help of asymptotic developments of certain curls of the field. Recently, Rene Reulos[2] has obtained a general solution in a remarkably simple form by considering asymptotic developments. The solution replaces the ordinary method of retarded potential solutions although the solutions of Reulos approach in the limit the classical solutions in the case of electrons of constant velocity.

The peculiarity of all these solutions lies in the fact that no assumption need be made with regard to the structure of the electrons or protons or of the field concerned, except that there are certain singularities of fields representable by poles of functions regulating the general field.

In this connexion, a remark of Reulos's must not be overlooked. He finds that his solution of the wave equation differs from the classical solution in the case of accelerated electrons. The reason for this appears to me to lie in the fact that in an asymptotic development the convergence is sometimes restricted, and hence the result cannot be identical with that derived from a finite series.

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[1] *Proc. Nat. Acad. Sci.*, March 1933.
[2] *C.R.*, 1015, March 12, 1934.

Shear Waves through the Earth's Core

IN 1914, Gutenberg[1] published an analysis of earthquake waves arriving at great distances, in which he inferred the existence of a major surface of discontinuity at a depth of about 1,800 miles, bounding a central core within the earth. His predictions regarding the characteristics of compressional (P) waves transmitted through this core have been abundantly verified. But until recently, no signs have been forthcoming of the existence of distortional (S) waves that had penetrated this central mass. The conclusion has thus gradually come to be accepted that the core is in a fluid or semi-fluid state, and is thus incapable of transmitting shear waves that reach its boundary. Two branches to both types of core waves were indicated by Gutenberg's theory, and have been designated by Macelwane P_1 and P'_2, S'_1 and S'_2 respectively.

Recently Macelwane[2] and Imamura[3] have published fragmentary evidence supporting the occurrence of shear waves transmitted through the core and conforming to Gutenberg's predictions. But the former expressed himself as dubious of the adequacy of the evidence; and the latter can scarcely be credited with settling the controversy on the evidence of a single identification—apart from the fact that the identification is open to criticism.