chamber was closed in each case for half an hour before observations of velocity were made.

Fruit-bodies of fungus	Density of spores	Diameter of spore, in μ	Observed terminal velocity in mm. per sec.	Calculated terminal velocity in mm. per sec. for a sphere with density and diameter equal to those observed for the spores	Actual terminal velocity exceeded calculated by a percentage of
Specimen I.	1·02	11·65	6·07	4·14	47
Specimen II.	1·2	10·19	4·85	3·21	51
Specimen III.	1·02	10·87	5·11	3·64	40

From the results just given it is clear that the figures obtained by observation for the rate of fall of the spores are of the same order of magnitude as those demanded by Stokes's law. However, the law is not confirmed in detail, for, as an average of the three experiments, it was found that the actual velocity of fall of the spores was 46 per cent. greater than the calculated. I have not been able to find any satisfactory explanation for the discrepancy between observation and theory.

My method for testing Stokes's law appears to have various advantages over that used by Zeleny and McKeehan, for the following reasons :—Amanitopsis spores have smooth walls, and are practically truly spherical, whereas lycopodium spores have sculptured walls, and are four-sided. Amanitopsis spores have a diameter only one-third as great as lycopodium spores. In the tube method convection currents cannot be eliminated, and it must surely be somewhat difficult to decide the exact centre of the spore clouds. By my method of using a very small chamber the difficulty of convection currents was reduced so as to be negligible, and the velocities of the individual spores could be measured with considerable accuracy. Amanitopsis spores are liberated spontaneously by the fungus, whereas lycopodium powder requires to be set in motion by artificial means.

In conclusion, I wish to thank Prof. J. H. Poynting for permitting me to carry out the experiments here recorded in the physics department of the University of Birmingham, and also Dr. Guy Barlow for valuable criticism.

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Winnipeg, March 25.

Ionisation by Röntgen Rays.

THE relative ionisations produced in different gases by beams of X-rays have been found by many investigators to depend so markedly on the penetrating power of the X-rays used that no regularity in behaviour has been discovered (see Mr. Crowther's paper "On the Passage of Röntgen Rays through Gases and Vapours," Roy. Soc. Proc., January 14).

Recent experiments which I have made upon homogeneous beams have, however, shown the connection between ionisation, secondary radiation, and absorption in a most striking way. As in the case of absorption phenomena (see letter to NATURE, March 5, Barkla and Sadler), a knowledge of the secondary radiation characteristic of an element is essential and sufficient to explain many of the phenomena of ionisation.

In order to test if such a connection existed, the first substance experimented upon was ethyl bromide—a substance which has been investigated in some detail by Mr. Crowther.

By using homogeneous beams of X-rays, I found that all radiations experimented upon which are not more penetrating than the secondary radiation characteristic of bromine (coefficient of absorption in Al=about 50) produce ionisations which are proportional, or at least approximately proportional, to the ionisation produced by the same beams in air.

When the radiation passed through the vapour was made more penetrating than the radiation characteristic of bromine, the ionisation rapidly increased—that is to say, the ratio of the ionisation in ethyl bromide to that in air rapidly rose to several times its original normal value. It was found to be essential to the production of what may be called the abnormal ionisation simply that the primary radiation be more penetrating than the secondary radiation which bromine emits. This result must be connected with the results of experiments on absorption and secondary radiation.

Thus, when an X-radiation incident on a substance R is softer than the secondary radiation characteristic of R, it is absorbed according to a simple law, the absorption being approximately proportional to the absorption in any other substance in which a characteristic radiation is not excited ; it produces no appreciable quantity of this secondary radiation, and it produces what may be called a normal ionisation in R. When the incident radiation becomes more penetrating than the secondary radiation characteristic of R, it is absorbed by an amount greater than given by the law stated ; it begins to excite the secondary radiation in R, and it produces an increased ionisation in R. The absorption and ionisation increase to several times their previous value, while the intensity of secondary radiation becomes very great.

As the penetrating power of the incident radiation is increased still further, the absorption by R diminishes, and the secondary radiation excited in R diminishes at the same rate as the ionisation produced by the incident radiation in a thin film of air.

(It should be pointed out that the great increase in ionisation is not due to the secondary radiation.)

In a similar manner, from a knowledge of the secondary X-rays emitted by iodine, the variable behaviour of methyl iodide may be explained. The effects of the lighter elements are comparatively small in all the three phenomena of absorption, secondary radiation, and ionisation.

Very many of the apparently complex results, obtained by experiments on the transmission of heterogeneous beams through compound substances, may be explained in terms of a few simple laws which have been obtained by the more fundamental experiments on elementary substances with the use of homogeneous beams.

CHARLES G. BARKLA.
University of Liverpool, April 7.

A Simple Fabry and Perot Interferometer.

DURING a course of experiments with interferometers it was found that a very simple and inexpensive Fabry and Perot instrument could be constructed of plate glass which gives results almost as good as the costly interferometer. The construction of this apparatus for demonstration purposes will well repay the teacher and student. The sharp-coloured interference rings obtained by using luminous gases in vacuum tubes as sources are extremely beautiful. The D lines from a sodium burner are easily separable. If the interference pattern, using a copper or iron arc, is focussed on a wide slit of a single-prism spectrometer, a section of the interference rings is seen in the various spectrum lines, illustrating the method of Fabry and Buisson, and Eversheim, for the determination of the new standard table of wave-lengths. The Zeeman effect can also be easily shown with this apparatus.

Take two pieces of plate glass about an inch square (I have used the so-called German plate) and silver [1] them

until one surface of each plate cuts down the intensity of the transmitted light to about a quarter of the incident light. Separate these silvered surfaces by two strips of cardboard. A useful thickness to begin with is about 0·45 mm., as this will clearly separate the D lines. Mount these plates over a half-inch hole in a metal plate by means of three pressure screws, two of which are shown in the above diagram, being a section through

[1] For silvering solutio s see the appendix to Baly's "Spectroscopy."