nests," for we regard the nesting instinct as no more inexplicable than the other instinctive actions which recur with almost clock-like regularity in the reproductive cycle of most birds. The entire round of activities which leads to the production of a certain type of nest, as in the robin, vireo, or oriole, is without doubt remarkably uniform and stable. But it is far less stable or uniform than the conditions which determine the form and color of the egg. If this is true it is not altogether surprising to find some open nests with snow-white eggs, and some closed ones, like the magpies', in which the eggs are spotted. Yet no one could maintain that the behavior of the wild bird is to be explained by any simple formulæ, at any point.

The abundant illustrations which have been drawn from a variety of sources, are naturally uneven in proportion and quality, half-tones of photographs from life having been excluded to keep down the weight, but the plan thus followed has certainly led to variety in abundant measure. FRANCIS H. HERRICK

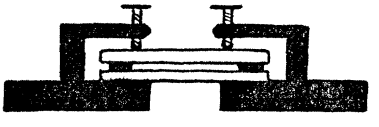
SPECIAL ARTICLES

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-colored 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 focused 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 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 till 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 the cover of the 24 two-cent postage-stamp book, 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 following diagram, being a section through the center. The third screw is midway between the other two and at the end of the plates.

Looking normally through the plates at the glowing filament of an incandescent lamp, a number of images of it will probably at first be seen. Adjust the pressure screws until these images are in juxtaposition in the line of sight; the silvered surfaces are then approximately parallel. Place the instrument in a clamp stand, and focus the light from a sodium flame or a vacuum tube upon the plates and look at the interference bands with a small laboratory telescope focused for infinity. Usually the eyepiece has too large a magnification for the above retardation and it is better to use in place of it a single lens



of focal length about two inches. At first only a small section of the interference pattern is seen, but with a little careful adjustment of the pressure screws the whole ring system is obtained in sharp focus. Removing the telescope and with the above lens used as eyepiece, focus the interference system from the above sources or an arc, upon the slit of a spectroscope. The bands in the different spectrum lines are then observed with the telescope on the spectrometer.

For further suggestions regarding the adjustments and other experiments for which this apparatus can be used, refer to an article

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

by the writer in the *Philosophical Magazine* for May, 1904.

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SOME COMMENTS ON THE REACTIONS OF PERICHÆTA

In a discussion of the method of trial in Science, Vol. XXVI., 662, Professor H. B. Torrey referred to the writer's description of the light reactions of *Perichæta*. He interpreted the behavior of *Perichæta* in weak light as displaying "Unterschiedsempfindlichkeit" and not the tropic reaction, with the resulting conclusion that there would be no orientation in weak light. The writer had stated that *Perichæta* responds to weak light chiefly when the anterior end is extended, presumably because of the greater exposure of photoreceptor cells in the integument. Torrey called these "Unterschiedsempfindlich" reactions because apparently due to an increase in the intensity of the light on the cells. Loeb first introduced the distinction between the tropism as a constant stimulus effect and the reaction to change of intensity in the case of *Serpula*, which bends towards the light and also withdraws suddenly into its tube from the stimulus of a shadow cast upon the oral end. Except for the opposite sign of the heliotropism the reactions of *Perichæta* and this other annelid bear a family resemblance. I need only refer to the familiar facts that *Perichæta* or *Lumbricus* turn away from all but the weakest light and retract into their burrows on sudden illumination. In the open, the worm gives the "Unterschiedsempfindlich" reaction of retracting its head on sudden illumination with strong enough light and after a period of backward creeping follows this up by a tropic, turning response effects of sudden illumination are conspicuously wanting in weak light, as ordinarily only turning movements appear.

A form of response to illumination of the anterior end which is between these extremes consists of creeping backward after a distinct pause, which is often prolonged, and without any sudden movements which would naturally be related to the change produced by the stimulus. These weaker responses might naturally be regarded as constant stimulus effects. Reactions attributed to change of intensity ought to give manifest evidence of the shock in resulting movements or inhibitions.

The objection is raised that the transitoriness of the stimuli in weak light, received during extension movements, would preclude their giving rise to orientation. The tropism is ascribed to a differential tonus produced on the muscles of the two sides. There is no apparent reason why even transitory light stimuli of any intensity might not produce some appreciable tonic effects. It appears, however, that a considerable change of intensity is required to temporarily inhibit forward movement, as is the case in retraction of the head. If the sudden manifestations of shrinking are absent in weak light is it not apparent that the threshold for "Unterschiedsempfindlich" effects is higher than for purely tonic, *i. e.*, tropic effects in the earthworm? As for the application of the trial hypothesis to the behavior in weak light, that is only giving a name to the somewhat gradual process of orientation, interrupted by movements contrariward which are less influenced by the light.

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ENTOMOLOGICAL CONFERENCE ON THE PACIFIC COAST

The department of entomology of the University of California has for several years past held four conferences during the school year at stated intervals, the place alternating with Berkeley. Thus during the last school year four such conferences were held, two at Berkeley, one at Watsonville and another at Davis. The last of these meetings, held in Berkeley, was planned to be more inclusive, inasmuch as entomologists from the entire Pacific coast were invited to attend and present papers. The hope was also expressed that a special organization of western entomologists might be effected, inasmuch as the insect problems of the Pacific slope are so different from those on the other side of the Rocky Mountains.

At this meeting, held April 20 to 23, the following general program was carried out: