

A SIMPLE APPARATUS FOR THE STUDY OF PHOTOTROPIC RESPONSES IN SEEDLINGS.

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The purpose of this apparatus is to determine the minimum quantity of light, acting as a lateral stimulus, that will produce a curvature response in seedlings of various kinds as well as some of the fungi, such as *Phycomyces* and *Pilobolus*.

Any kind of light may be used, but in the comparative studies I use direct sunlight. The quantity of light is regulated by opening and closing an iris diaphragm with various-sized apertures for definite lengths of time.

The apparatus is made from a microscope carrying case. As shown in the photograph, Fig. 1, the outside attachments are the drawtube and rack and pinion of a microscope removed from the base and attached to one side of the box. The tube works through a hole in the side of the box. The opening is made light proof by a velvet collar, Fig. III, VC, glued to the rim and held to the tube of the scope by rubber bands.

Into another hole is fitted a hemispheric, revolving iris diaphragm, Fig. III, I. This is on the adjacent side of the box close to the microscope and on the same level with the objective of the microscope. A mirror is attached to the box to reflect light directly into it through the iris and onto the plant. A micrometer eyepiece in the microscope is the index by which all of the readings are made. The illumination for the readings is supplied by the light which passes through the bottle, Fig. III, K, into a solid glass rod, SG, and conducted by the rod to within a half inch of the plane in which the plant is held and ends directly opposite to the objective of the microscope. This glass rod should be approximately one-half of an inch in diameter so as to present a field of sufficient size.

The bottle contains a saturated solution of bichromate of potassium in water. This solution is to absorb the active blue-violet rays of light. The glass rod is covered with black tape, Fig. III, T, and the opening into the box through which the rod extends is sealed against the admission of light

by a velvet collar. A black cardboard collar, Fig. III, BC, slips over the bottle and rests upon the platform below the bottle. A piece of white cardboard on the platform serves as a reflector for the light entering the bottle. It is this dull red light which is carried to the objective of the microscope and used to make the readings. This light enters only when making the readings and has not, in the number of cases tried, produced any stimulus that would effect the experiment and alter the response to the normal light stimulus. However, I have yet to try experiments on *Phalaris*.

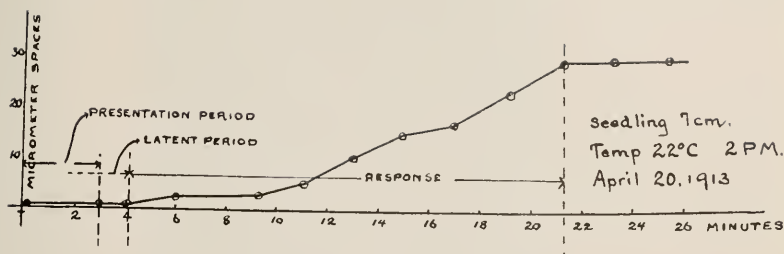
The internal construction of the box, Fig. II, consists merely of a vertical rod on which works a burette clamp. The rod is so placed that a test tube containing the plant under study can be adjusted easily into position opposite both the iris and the objective of the microscope. The door of the box is fitted with strips of velvet so as to make it light proof.

To use the apparatus, seedlings are grown in soil, sawdust, etc., in test tubes in the dark room. These culture tubes should always be held in a vertical position while being adjusted in the box for study. The box is "loaded" in the dark room and the plants placed so as to be in the field of the microscope. The iris is closed and the door of the box is locked. The plant is then brought into focus using the illumination secured by raising the collar, BC, to a sufficient height and thus permitting the reflected light to enter the bottle from below. Readings are taken at intervals of several minutes before opening the iris in order to be certain that no geotropic stimuli other than the normal are acting. When no readings are being taken the collar rests upon the platform.

The plant is then laterally stimulated by opening the iris to any desired size for a definite length of time. The mirror reflects the light through the iris onto the plant.

The microscope is kept covered at all times with a photographer's focusing cloth. All of the readings are made under this cloth. This prevents any light from passing through the microscope and being focused onto the plant.

To record the results a graphic record may be made, using the ordinates to denote the extent of curvature in spaces on the micrometer eyepiece, and the abscissas to denote the time of stimulation, or presentation period, the latent period, and the length of time for the completion of the response. Figure IV illustrates such a record:

Fig. IV. Study of *Avena sativa*.

The ventilation of the box is unimportant for the short periods required for each study. A wet sponge placed inside of the box serves to keep the air moist. The temperature of the apparatus can also be recorded and all tests made under equitemperatures.

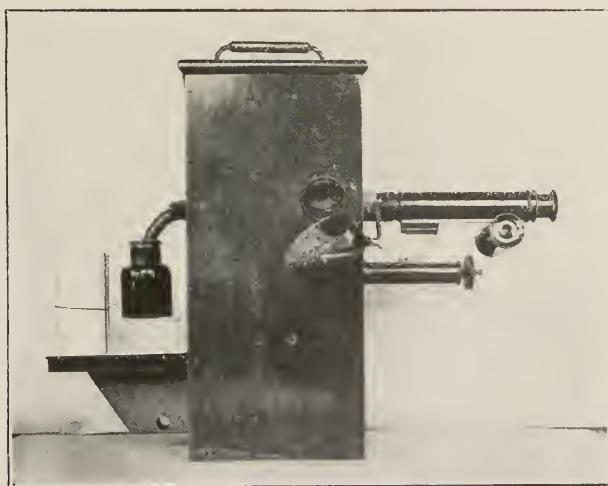


Fig. I. External View of Apparatus.

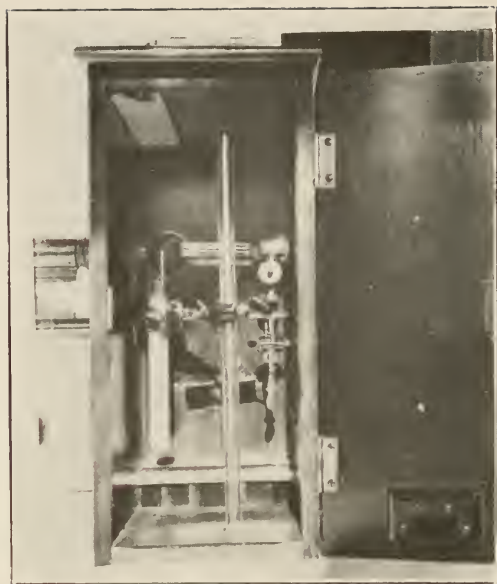


Fig. II. Internal View of Apparatus.

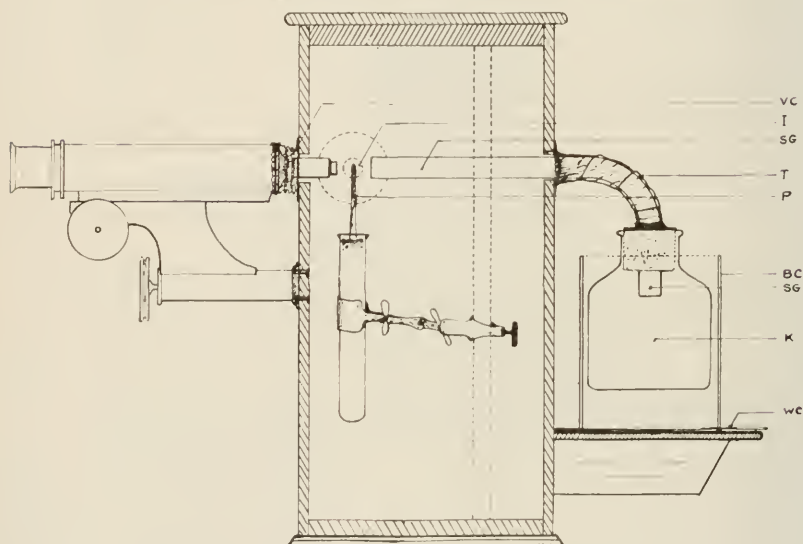


Fig. III. Cross section of the apparatus to show the position of the plant and its relation to the microscope and the glass rod; VC, velvet collar sealing the aperture through which the microscope works; I, the iris diaphragm; SG, the glass rod; T, tape covering the glass rod to make it light proof; P, the plant; BC, the collar which slips over the bottle; K, the bottle containing the saturated solution of bichromate of potassium; WC, the white cardboard to reflect light into bottle.