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RECENT ADVANCES IN PHYSIOLOGY OF REPRODUCTION OF PLANTS[1]

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OUR knowledge of the physiology of sexual reproduction in plants is still rather limited and of quite recent origin. This is undoubtedly due to the fact that most higher plants are hermaphrodites and that the sexual organs are rather minute and ephemeral. It should be possible, however, to overcome this difficulty imposed by the material, at least in certain restricted phases of investigation of reproduction, by the use of large numbers of individuals, which permits the isolation of sufficient quantities of desirable tissues for a physiological and chemical assay. Then, too, the relatively small size and comparative ease of manipulation of many plants would seem to fit them to a variety of experimental observations and treatments.

For the purpose of orientation, sexual reproduction of higher plants may be subdivided into certain steps or phases, of which the following appear to be of major importance: (1) Initiation or "ripeness" of the sporophyte for reproduction; (2) chromosome conjugation (synapsis) and spore formation—the beginning of the gametophytic generation; (3) pollination and growth of the male gametophyte; (4) fertilization or union of gametes and (5) development of the embryo and its influence on the mother sporophyte.

For various reasons, which can not be taken into account here, some of these phases have been investigated more extensively or more thoroughly than others.

[1] Retiring president's address, American Society of Plant Physiologists, Atlantic City, December 29, 1936.

[2] Contribution from the Missouri Agricultural Experiment Station, Journal Series No. 506.

new board (No. 3) with thumb tacks and the next contour line cut. Now this strip of paper, cut from between the first and second contours, is carefully pasted along the edge of board No. 2, where it fits perfectly.

Repeat the process; *i.e.,* the remaining part of the map is again fastened to a new board (No. 4) and again another contour is cut out on the jig-saw and the strip is pasted to board No. 3. This is continued until the map is used up, is cut along every contour and each strip is pasted to the previous board where it belongs. Tubes of Duco cement are most convenient in pasting the strips of map to the boards.

These odd-shaped boards, each smaller than the one preceding it and of similar shape, are then put together, using the paper strips as guides; they may eventually be glued and nailed securely. The finished block with all water and cultural features appears, especially from a point directly above, as a faithful reproduction of the original map. The vertical exaggeration depends upon the thickness of the cardboard used; for instance, the two-tenths inch Upson board in connection with a twenty-foot contour map gives an inch for each hundred feet of elevation.

Certain problems arise with respect to depressions, outlying hills and such that may be separate from the main part of the map. It should be kept in mind that the contour around any such feature should be cut at the same time and from the same board as the corresponding contour in the main map.

Moreover, in a rather simple manner one may make a model in plaster as a by-product from this process. This involves saving the "waste" or "scrap-pieces" as they are cut away from each contour; they are put together, piled up to make a mold—a negative—that gives a depression where a hill existed. One should use the positive, the relief map itself, as a guide in placing the negative pieces and it should be done before the positive is glued or nailed together. The negative must be smoothed with plastic material before the casting is attempted in order to avoid the sticking of the final plaster model as it is "pulled." While such a "plaster model" is more like the natural land surface in its smooth slopes and may have the advantage of being waterproofed, yet it lacks the details of roads, cities and streams that the cardboard relief map may have.

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STARFISH STAINS

LOOSANOFF[1] has reported that starfish stained with Nilblue sulfate are apparently uninjured and retain the blue color for as long as three months. To trace migration from two separate winter concentrations in Narragansett Bay this year, experiments were carried on for the purpose of obtaining one or more additional dyes.

The first tests were made with varying concentrations, but in all cases it was found that a concentration of 1 g per liter of solution was not toxic for a short immersion period and that such a concentration was necessary to obtain staining in a period of less than five minutes. The following results are for this strength of solution.

Janus Green and Lichtgrun, made by Dr. Gruebler and Company; du Pont Brilliant Green and Malachite Green, made by the du Pont Company, and Chrome Green C. B. and Erie Green W. T., made by National Aniline Company, were the green dyes tested. The first and third stained, but the color was not lasting. The fourth stained blue, and the others did not take.

The red dyes tested were Neutral Red, made by Dr. Gruebler and Company, and Rhodamine B, made by the du Pont Company. The latter stains well, but the color fades. Neutral Red, however, stains well and the color holds.

Other dyes tested were Basic Brown, Crystal Violet and Methyl Violet, all made by the National Aniline Company. The first stained dark red, which faded slowly, while the last two faded very rapidly.

Neutral Red was selected as the most satisfactory of these dyes, and several thousand specimens have been stained and liberated in the Mount Hope Bridge region. In control live cars, there has been so far no detectable change in Neutral Red stained starfish over a period of four weeks.

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[1] Loosanoff, SCIENCE, 85: 412, 1937.

BOOKS RECEIVED

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EVANS, W. H. *A Catalogue of the African Hesperiidae.* Pp. xii + 212. 30 plates. British Museum (Natural History). Oxford University Press. £1.

HOLMES, S. J. *General Biology.* Pp. vii + 467. Revised edition. 233 figures. Harcourt, Brace.

PINCUSSEN, LUDWIG. *Mikromethodik.* Pp. vii + 193. 31 figures. Franz Deuticke, Leipzig.

Report of the First Scientific Expedition to Manchoukuo. Section II, Part III; Section III; Section V, Division I, Part III; Section V, Division I, Part VI. Waseda University, Tokyo.

RUTHERFORD, LORD. *The Newer Alchemy.* Pp. viii + 67. 13 plates. Cambridge University Press, Macmillan. $1.50.

Société de Biogéographie; Contribution a l'Etude des Reserves Naturelles et des Parcs Nationaux. PAUL LECHEVALIER, Editor. Pp. 267. Illustrated. Lechevalier.