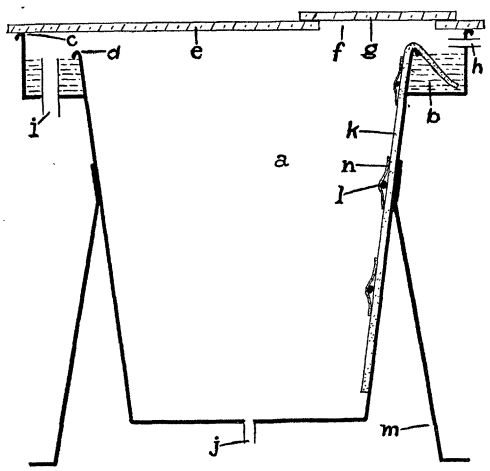
A GERMINATOR FOR ROOT WORK

THE germinator illustrated schematically in the accompanying figure has been developed for obtaining germinated seeds with straight roots for use in testing the effects of environmental conditions on elongation of the young radicle (by the Macht-Livingston technique[1]) and in starting seedlings intended to be grown in solution-culture or by a sheet-culture technique shortly to be described. It incorporates a feature found in the Vogt germinator[2] of the absorbent stratum on which the seeds rest, being kept moist by capillarity in a downwards direction, but differs from it in the nearly vertical position of the absorbent stratum, and in this stratum being on the inner face of a cylindrical (or, more correctly, frusto-conical) surface.

The general plan of construction of the germinator is that of an oversized bucket (the moist chamber, *a* in the accompanying figure) with an annular water



trough (*b*) built onto its rim, on the outside. The outer rim (*c*) of this annular trough is decidedly higher than its inner rim (*d*), so that there is a clear space between the inner rim (*d*) and a circular sheet of glass (*e*) resting on the outer rim (*c*) and serving as a removable transparent cover for the germinator. In this glass cover is a circular opening (*f*) six inches in diameter, placed so that it comes above the outer edge of the moist chamber and somewhat over the water trough. Through this opening it is readily possible to add water, for instance, to the water trough, or to insert a hand and carry on manipulations (such as the withdrawal of germinated seeds) in the moist chamber, with a minimum disturbance of the humid condition of the air in the chamber. An eight-inch circle of glass (*g*) resting on the main sheet of glass serves to close this opening when not in use. An opaque metal cover (not shown) rests on the glass cover and serves to exclude light from the germination chamber. An inflow tube (*h*) and an overflow tube (*i*) make it possible to maintain the water level in the trough by continuous water flow. The tube (*j*) in the bottom of the moist chamber serves to carry away the drip water from the absorbent paper strips (*k*) on which the germinating seeds (*l*) rest. (*m*) indicates the supporting legs of the germinator.

As has been indicated, the seeds (*l*) are germinated on strips of absorbent paper (*k*), the upper ends of which dip into the water in the annular water trough. Small seeds, such as mustard and cabbage, are readily held onto the paper simply by the force of cohesion of the water film on the surface of the wet seed with the water of the wet paper; but for additional protection a small piece of wet absorbent tissue paper (*n*) is dropped over the seed. Larger seeds, such as green pea and corn, are attached by wrapping a piece of absorbent tissue paper around the seed and the paper strip.

As compared with the germination of seeds in moist sawdust or ground sphagnum or sand, the method described here has the obvious advantages of the young root developing in water-saturated air under conditions of minimum disturbance by mechanical contacts, as well as of the germinating seed being available at all times for inspection without being subjected to mechanical disturbance. An additional and decided advantage is that the germinated seed is readily manipulated (as, in the Macht-Livingston technique, introduced into solutions to be tested) by means of the absorbent paper strip to which it is attached. Further, if, at the beginning of the test, the strip of paper bearing the germinated seed is cut at the length of the young radicle, then the extension of the root beyond the cut end of the strip at the close of the test period is a measure of its elongation during that period.

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[1] *Jour. Gen. Physiol.*, 4: 573–584, 1922.
[2] German patent 20,070, November 20, 1882.

BOOKS RECEIVED

BLANTON, MARGARET G. and SMILEY BLANTON. *For Stutterers.* Pp. xi + 191. Appleton-Century. $2.00.

British Museum (Natural History). *Great Barrier Reef Expedition, 1928–29, Scientific Reports.* Vol. V, No. 1. *On the Rock-Boring Barnacle, Lithotrya Valentiana.* By H. GRAHAM CANNON. Pp. 18. 7 figures, 2 plates. *The John Murray Expedition, 1933–34, Scientific Reports.* Vol. I, No. 1. *Introduction and List of Stations.* By R. B. SEYMOUR SEWALL. Pp. 41. The Museum.

FURNAS, C. C. *The Next Hundred Years: The Unfinished Business of Science.* Pp. xiv + 434. Reynal and Hitchcock. $3.00.

KENDALL, WILLIAM C. *The Fishes of New England: The Salmon Family.* Part 2, *The Salmons.* Pp. 166. 11 plates. Boston Society of Natural History.

Science Reports of the Tohôku Imperial University. Second series, *Geology.* Vol. XVIII, No. 2. Pp. 178. 5 plates. Maruzen, Tokyo.