

power when grown on mineral nutrient agar containing a nitrate and glucose. There was no fixation when nitrogen was supplied in the organic form, and with a nitrate present but no carbohydrate, the amount of fixation was not marked enough to be conclusive. There seemed to be some fixation in the latter case, the lesser amount being due, perhaps, to the much decreased growth where the carbohydrate was omitted. One species seemed to have the power of denitrification as well as nitrogen fixation. The amount of nitrogen fixed by the algal species used compared favorably with the amount recorded by other investigators as fixed by the nitrogen fixing bacteria. The results recorded in this paper are contrary to the generally accepted view as to the ability of green plants to make use of free nitrogen. The possibility of green plants possessing this power of nitrogen fixation, however, is of such great interest both scientifically and economically that the work of WANN should be the stimulus for much more work along this same line.—S. V. EATON.

**Variation in stomata and hydathodes.**—In a study of the number of stomata per sq. mm. upon leaves of *Campanula rotundifolia* borne upon different parts of the same plant and upon the leaves of plants grown under different conditions of habitat, Miss REA<sup>18</sup> found some interesting variations. In general there was an increase in number from the lower to the higher position of the leaf upon the shoot, and an increase with conditions of increasing dryness. Such increase was least upon the under surface of leaves on different portions of the stem of the same plant. It is suggested that the increased number upon sun shoots compared with those developed in the shade is due to increased photosynthesis, although no causal connection is established. It would be desirable to know the connection between the size of the epidermal cells and the number of stomata, but this information is not given. Groups of hydathodes were found on the upper surfaces of all leaves examined, the number per leaf decreasing from the base to the apex of the shoots.—G. D. FULLER.

**Water relations of *Pinus* and *Leucadendron*.**—Following methods devised by FARMER, the water conducting power of the wood of *Pinus pinaster* and *Leucadendron argenteum* has been measured by AITKEN,<sup>19</sup> and a comparison instituted between transpiration and the rate of water transmission. The rate of transpiration was higher in *Pinus*, both per twig and per unit area, than in *Leucadendron*, as was also the ratio of transpiration to transmission. From the data obtained it would seem that the wood of *Pinus* is capable of transmitting a limited amount of water which it utilizes with a very small margin of surplus.—G. D. FULLER.

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<sup>18</sup> REA, MARGARET W., Stomata and hydathodes in *Campanula rotundifolia* L., and their relation to environment. New Phytol. 20:56-72. figs. 6. 1921.

<sup>19</sup> AITKEN, R. D., The water relations of the pine (*Pinus pinaster*) and the silver tree (*Leucadendron argenteum*). Trans. Roy. Soc. So. Africa 10:5-19. 1921.





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