

## THE EXPERIMENTAL CONTROL OF PLANT GROWTH\*

ONE would have hardly imagined half a century ago, when the classical experiments on the effect of environment on photosynthesis, respiration and growth were conducted, that a day would come when man's ingenuity would create accurately controlled artificial environmental conditions where the mysteries of nature could be studied at great depth under almost perfect reliability and reproducibility of those conditions. Equally difficult to visualize two decades ago was the fact that this modern "phytotron" as they call it, could be constructed almost exclusively by air-conditioning and refrigeration equipments and that fluorescent lighting so popular in our domestic and industrial lighting programmes could provide all the light energy (comparable with the solar spectrum) needed for normal plant growth without dissipating heat into the plant growing chambers. Many in our country may consider it sheer luxury to grow plants under air-conditioned environment and perhaps the most enlightened administrator may shrink from a decision to sanction a phytotron to university centres of plant research. I, for one, would demur most emphatically and would commend the reading of this delightful book to those that might view it in that light and feel certain that they would change their minds. In a vast agricultural country like ours, technical aid of this kind to fundamental workers appears a necessity. In my view it would not be enough to build a large phytotron in any one centre; indeed, the answer is to design smaller ones and make them available to active university and agricultural workers in India who have a sound record of work in plant physiology, pathology, embryology or genetics.

I shall now pass on from general considerations to a brief statement of the valuable contents of this book. The scientific, technical and financial resources of the famous CALTECH (California Institute of Technology, Pasadena) and the Clark Greenhouses and Earhart Plant Research Laboratory have enabled the installation of this phytotron with much thought and ingenuity. The construction costs of \$407,000 came from the private munificence of the Earhart Foundation and the technical skill that went into the construction came from a close liaison between scientists, engineers, architects and administrators. The yearly

costs, including salaries of operating staff and maintenance is mentioned as \$60,000. The general principles of air-conditioning, refrigeration, spraying of cold water continuously during the day on the green-house glass roofing (which absorbs as much as 20% of the infra-red) and details about artificial lighting and the control room, ballast and transformer housing as well as the use of automatic CO<sub>2</sub>-analyzers are excellently set out. Methods of handling plants are also very well described. The research projects covered in these controlled houses are far too many to be enumerated here. Suffice it to say, that much of what has been achieved should be an eye-opener to many botanists particularly, the observations on nycotemperatures and the effect of controlled temperature, light, etc., on genotypic and phenotypic variability.

A statement of significance appealed to the reviewer in the concluding chapter of this book, viz., that if we are to raise the study of plant science to those of the "exact" sciences, experiments with plants have to be carried out under rigidly controlled conditions and that inadequate experimental techniques as hitherto prevented the development of a "Theoretical Botany" compared to "Theoretical Physics". This should be wholly endorsed as much data of significance to the physiologist, geneticist, horticulturist and agronomist and those interested in climatological studies and plant growth as a world problem could emanate from these phytotrons. Many botanists outside the U.S.A. have also realised the importance of constructing phytotrons; notably, Sweden has a modern version and most of us in this country have recently heard an exposition on the construction of this at Uppsala from Prof. Nygren. Indeed, the Uppsala unit has an electronic brain controlling the operation of this unit and any breakdown raises an alarm round the clock communicated to the researcher over the telephone.

There could be little doubt that this book is to be most warmly commended as a reference book in all botanical laboratories and, I suppose, architects, technologists, physicists and engineers would benefit by reading this as here lies the future of plant research. The botanist by himself may not be up to the task and would not be able to construct these phytotrons without collaboration if he were not to waste national resources by a "trial and error" method of construction.

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\* *The Experimental Control of Plant Growth*. By F. W. Went. (Chronica Botanica Co., Waltham, Mass.), 1957. Pp. xvi + 343. Price \$ 8.50.