A new phytotron design, engineered at Davis, will allow plant researchers to utilize sunlight—the most economical, best quality and highest intensity light available—along with artificial illumination for controlled condition plant growth experiments. Prismatic glass blocks in roof and sides of the house allow shadowless light plus good insulation. The small phytotron (shown in photo) is mounted on a rotating base and will be duplicated in a large, full scale room that will turn automatically to follow the sun.

New Davis PHYTOTRON Follows the Sun

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The best features of both greenhouse (sunlight) and conventional growth rooms (insulation) were combined in the Davis phytotron to utilize sunlight to a maximum degree and to provide a wider range of environmental conditions. Several experimental models of different sizes were built to study different phases of the entire operation of phytotrons (the name for rooms in which plants are grown under conditions of controlled climatic factors). Sunlight provides the best quality of light for plant growth and is also the least expensive source.

Environmental factors influence a plant's metabolism and the expression of its genetic potentialities, but to unravel the effects of different factors it is necessary to change only one at a time. This requires phytotron facilities. The simple greenhouse does not provide sufficient control or range of conditions.

Rotating model phytotron room is designed to follow the sun and features prismatic glass blocks covering three side walls as well as sloping roof.

Glass blocks

A roof of prismatic glass blocks was built to permit effective use of sunlight and give shadowless light inside the room plus good insulation. When clouds limit sunlight, or when the daylength is to be extended, artificial incandescent lights are blended in with sunlight by photoelectric control to provide a constant minimum light intensity. A dark curtain can be drawn over the roof to exclude sunlight when short days are required.

The first model built had a roof that was nearly flat. The later, more efficient designs employ a sloping roof and admit some light through portions of the walls. The rotating model shown in photo has a roof and three sides constructed completely of glass blocks.

COVER PHOTO shows three phytotron models at the Davis campus. To left, background, is the large room built first with nearly flat, 13-foot high glass block roof. In front of the large room, left foreground, is a small model and rotating mirror (on tripod), used with reflector on post above it, to direct sunlight down through flat roof. Rotating phytotron room, to right, has one half of the glass block roof paneling removed.

F. P. Zscheile examines pea plants grown in phytotron room at Davis. Prismatic glass blocks in roof admit shadowless sunlight and offer good insulation. Lights around ceiling (some off and some on) are used when sunlight is blocked by clouds or the daylength is to be extended by blending through photo-electric control to provide constant minimum light intensity.

Air is channeled through perforated walls, allowing a continuous even flow through the room—after being adjusted to the temperature required and humidified to the desired degree. The heat from light sources is thus drawn through a conditioning chamber, where it is removed by mechanical refrigeration.

Temperatures, relative humidities, and light intensities are recorded continuously. Time clock operation of all controls gives great flexibility to conditions attainable and provides easy day-night fluctuations. Temperatures may range from 35° to 120°F, making possible the simulation of a wide variety of climates, to match those found in California.

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Unlike most phytotron chambers, the large room has a 13-foot high roof, that can accommodate small trees and the larger agricultural plants. The useful floor area is $12\frac{1}{2} \times 16\frac{3}{4}$ feet. Numerous species of plants were grown in the large room, including peas and lettuce at a time of year when greenhouses were far too warm for these plants. These results were very promising.

Researchers and graduate students working in many areas of scientific investigation will find this type of phytotron a useful tool. Problems never before studied will be subject to investigation with sunlight now available under controlled conditions. For most crops, little is known about how much natural sunlight is needed—or can be utilized—for good production.

Power costs

Costs of electric power to operate the large phytotron room were recorded for light, refrigeration and heat separately during typical experiments. Costs of artificial "weather" can thus be calculated. The use of sunlight resulted in great savings in operational costs. Another method of sunlight admission tested was by reflection from a rotating mirror system, through a flat roof of glass blocks.

A large rotating phytotron room is being planned that will track the sun—admitting high intensity sunlight all day long. It will also have other controls now provided only in the large room.

Experimental efforts were guided by the needs of the Davis campus plant science departments and aided by counsel and help from the Planning Committee for Controlled Environmental Facilities for Plants as well as the staff of the Agricultural Engineering and the Plant Service departments. During the last two years of this four-year study, the University was aided by generous financial support from the National Science Foundation, Facilities and Special Programs.

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APHID PREDATORS SHOW PROMISE

Some of the species of parasitic wasps, introduced from the Orient during the first six months of 1961, already show promise of establishment. Those which attack the cotton aphid (or melon aphid) include *Aphelinus* spp. from Hong Kong and Taiwan, and *Trioxys* sp. from Taiwan. *Aphelinus gossypii*, which was introduced from India in late 1960, has been colonized on and recovered from cotton aphid at Riverside.

Species of parasites and predators collected from and introduced against the spirea aphid (or green citrus aphid) include *Aphelinus* sp. from Taiwan. Also introduced were three coccinellids, *Lemnia personata, L. swinhoei* and *Propylea japonica*, which reproduce well on a sole diet of spirea aphid in the laboratory.

An aphidiine wasp, *Ephedrus* sp., which reproduces well on rose aphid, was introduced from Taiwan.

The beneficial insects cited above constitute initial introductions into California, and their performance in the field will be of interest to commercial growers and the gardening public alike.—*T. W. Fisher and E. I. Schlinger, Dept. of Biological Control, Riverside.*