

For Thinking People

The Evolution of Greenhouses



By Ruth and Bob Haag

Structures to encourage plants to grow earlier or later than their season have been developing for a long time.

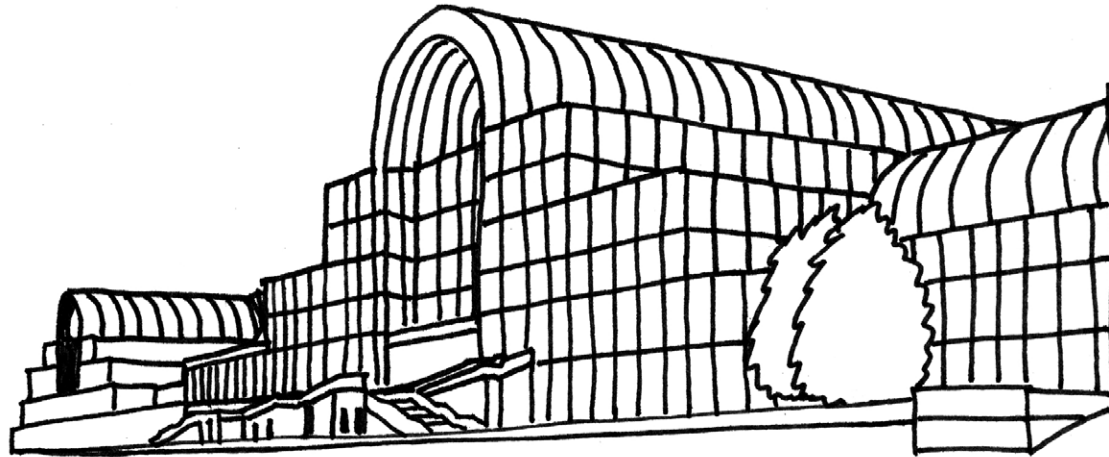
Cold frames, which are plant containers with transparent material over them, were produced in Roman times. Since flat glass was not easy to make, mica was used. This clear mineral can be cut into very thin sheets. When placed on top of the container, the mica acted like glass, allowing the sun's heat in, and keeping it inside. These early cold frames were called specularia by the Romans.



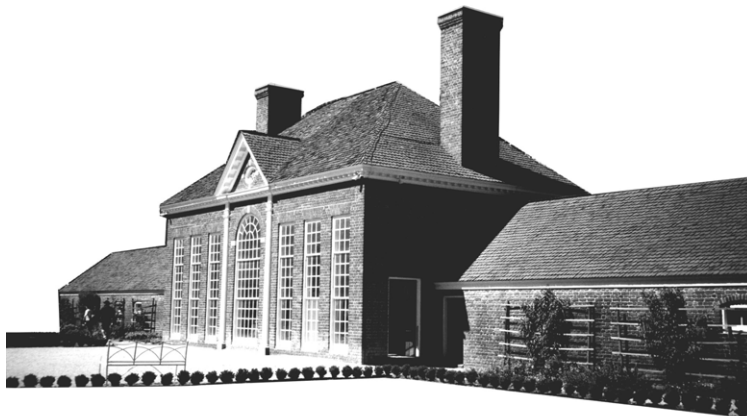
A Roman pot with a sheet of mica on top - 100AD

The Roman writer Lucius Junium Moderatus Columella described some cold frames using mica, that were constructed for Tiberius Caesar, so that he could have cucumbers during most of the year.

From the 1500s to the 1800s, "botanical gardens" were built in Italy, "orangeries" were built in



The Crystal Palace - 1851 Exposition

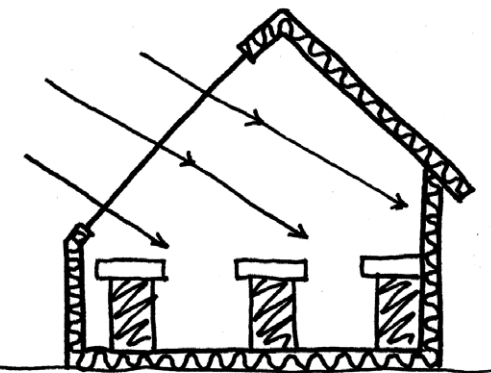


The Orangery at Mount Vernon - late 1700s



The Orangery at Mount Vernon from the inside

France and "conservatories" were built in Great Britain. These were all different names for the same thing: Rooms built to house small trees indoors during the winter. They were usually built with brick or stone on three sides, a normal roof, and large windows on the south side. Orangeries were often built as status symbols. They were often very elaborate, with fountains and sitting areas in them.



A Passive Solar Shed

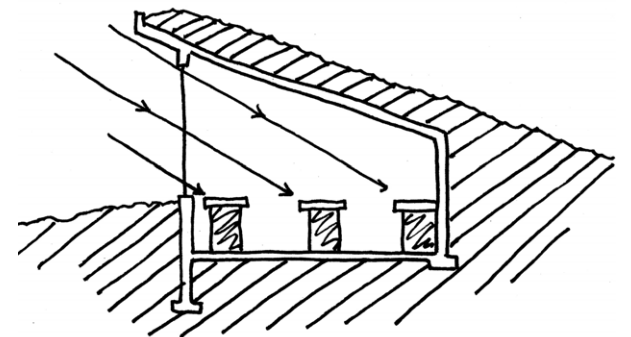
A visit to Monticello or Mount Vernon will show an example of an orangery.

Large glass greenhouses were not built until the 1800s, when the evolution of glass manufacturing made them possible. The Crystal Palace, built in London for the 1851 Exposition, was practically built just to show that it could be done.

The original intent of cold frames and all-glass greenhouses that stand alone was to extend the growing season a few months in either direction.

The sun is trapped inside when it isn't very warm outside, and the plants are encouraged to grow earlier and stay alive longer in the season.

However, in cold climates, the energy from the sun alone cannot keep the all-glass greenhouse warm enough in the depth of winter, and a great deal of extra heat must be supplied.



An Earth Sheltered Greenhouse - late 1970s

For keeping plants economically warm during the winter, the orangery design is much more practical than the all-glass greenhouse. Only the southern side admits light (and loses heat). The other three sides, and the roof, can be made of well-insulated materials. A modern-day example of this design is the passive solar shed.

A more extreme version is an earth-sheltered greenhouse. The thermal mass of the earth will keep the interior near 55 degrees

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all year. Sunlight admitted during the winter can raise the air temperature, and night covers can hold the warmth in overnight. Thermal storage can be increased by means of water vessels.

References:

A History of Landscaping Indoors by Scott D. Appel (2000), *Wikipedia*, *Pliny the Younger's letter XXIII to Gallus (circa 100AD)* *Earth Sheltered Housing Design* by the *Underground Space Center*, *University of Minnesota* (1979).