

### Pattern for Survival

► MOST FAMILIAR higher plants meet the problem of winter survival in one of three ways: (1) Annuals, that die in autumn, trust their hopes for the coming generation to seeds; (2) Perennial herbs die down to ground levels, but keep their underground rootstocks, roots, bulbs or corms alive; (3) Trees, shrubs and woody vines let their leaves die, and keep next spring's leaves and flowers tightly packed in buds, backed up by stored foodstuffs in the stems.

No matter which of these three patterns for survival is used by any given species, the living contents of seed, bulb or bud receives much the same kind of internal protection. It is useless to "wrap them up warm," as old-fashioned nursery rhymes used to tell us. This is reasoning from human analogy—that is, from the viewpoint of a warm-blooded animal. Plants are not warm-blooded; they have practically no internal temperature resources that even the snuggest fur wrappings would preserve.

The living stuff in the survival organs must therefore be able to endure temperature drops to far below freezing point and still not freeze to death. It must also be able to hang onto a necessary minimum of moisture against the insistent pull of winter-time evaporation when no sap is rising to replace water losses.

This is accomplished principally by having as low a water content as can be managed, and yet stay alive. As everybody knows, actively growing plants in summer are very moist and sappy. Their cells are large, with big water-spaces in them. But the cells in over-wintering seeds and buds are small, and their contents consist of thickened protoplasm, of the approximate consist-

ency of dry cheese, together with condensed storage foods like oils, starches, dense sugar solutions, and other carbohydrates that resemble mucilage or gelatin.

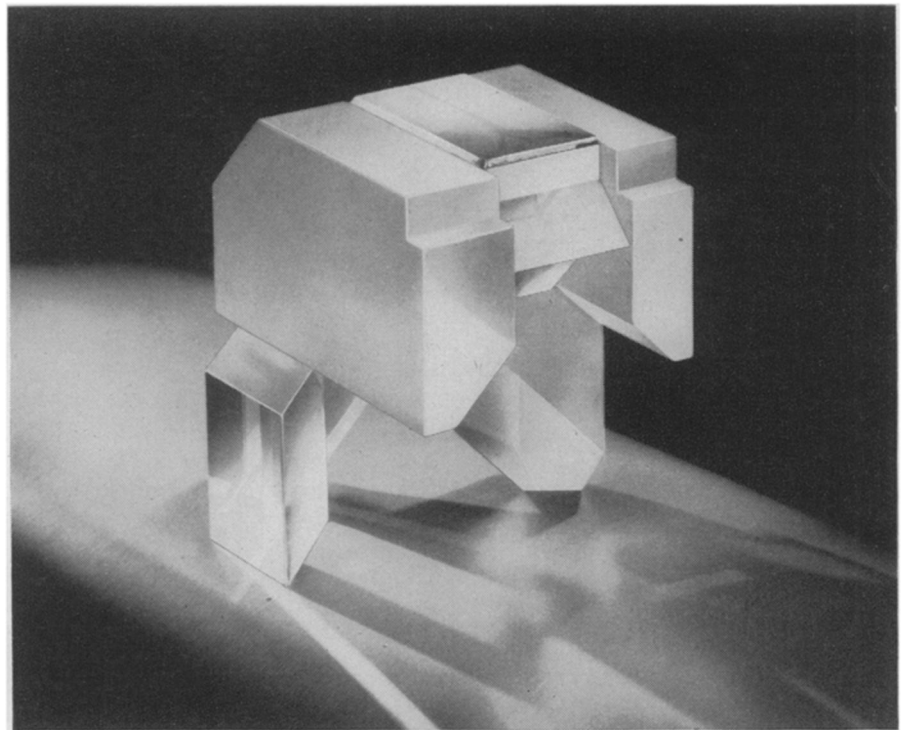
Substances like these are far better able to resist both freezing and drying out than are the watery saps of summer. You can make a rough test for yourself if you like: Just set vials of water, table syrup and mucilage, respectively, in the ice cube compartment of your refrigerator

(or outdoors on a freezing night) and see which of them freezes first.

*Science News Letter, November 4, 1944*

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