from freezing during the winter is to keep tubs of water around. On cold nights this water freezes but in so doing liberates a large amount of what is called "latent" heat. Ice, in other words, gives up heat when it forms and requires heat to melt it, a fact which enables refrigerators to create cold.

In Prof. Harkins' thin film experiments many of the ordinary rules of heat and cold seem to be non-existent, but actually the same laws hold, though greatly disguised. Using an organic substance called pentadecylic acid it was found that when the molecules in the thin film are far apart the material exists as a gas in two dimensions only.

On compression, Prof. Harkins reported, this two-dimensional gas begins to change into a two-dimensional liquid. If this liquid is further reduced in area a second and remarkable type of liquid is created. This liquid is at first highly compressible, then becomes quite incompressible as the pressure is increased.

Finally, as the area is greatly reduced, the second kind of liquid shrinks and the liquid film freezes, but it is remarkable freezing in which no latent heat is evolved. "Thus," says Prof. Harkins, "a kind of 'ice' is formed which requires no heat to melt it."

The thin films which Prof. Harkins and his group have been studying have only two dimensions—length and width. The thickness is only that of a single molecule, that is, a fifty-millionth to a ten-millionth of an inch. These thin films have remarkable departures from the behavior of ordinary three-dimensional matter. (1) No heat is required to melt the solid. (2) Very little heat is required to expand the first type of liquid as long as its molecules stay packed about as tightly together as in three dimensions. (3) There then ensues an expansion of this liquid film such that the intermolecular distance may increase as much as 35%.

This expansion occurs without a change of state, but nevertheless the heat absorbed is very great. For example, if the film consists of pentadecylic acid this extension of the film absorbs as much heat as it used in the evaporation of the same number of molecules of water at ordinary temperatures (11,000 calories per mole).

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● RADIO

Dr. Alexander Wetmore, assistant secretary of the Smithsonian Institution, and secretary general of the Eighth American Scientific Congress will interview eminent Latin American scientists who are participating in the Congress as guests on "Adventures in Science" with Watson Davis, director of Science Service, over the coast to coast network of the Columbia Broadcasting System, Thursday, May 16, 4:45 p.m., EDST, 3:45 EST, 2:45 CST, 1:45 MST, 12:45 PST.

Listen in on your local station. Listen in each Thursday.

RESOURCES

War's Demands for Wood Wreaking Havoc In Canada

Toll of Timber Increased by Fact That Less Than 7% Of Sitka Spruce Cut Is Suitable for Aircraft Work

WORLD War II is taking a heavy toll of the Pacific Northwest's famous but almost irreplaceable tall timber, one of the last stands of big trees in the world, conservationists in Vancouver and in Seattle declare.

Cutting of Sitka spruce, the 250-foot forest monarch whose best cuts go into military training planes, is up about 50% since the declaration of war, a British Columbia Forest Service official estimated. The available supply of virgin spruce will last less than 40 years at the present rate of cutting, instead of the 50 years the pre-war cutting rate would have allowed.

The take of Douglas fir, best Pacific coast lumber tree and one of the finest in the world, is such that virgin stands of this species of fir will not last more than 15 years. Production is temporarily off because of a shipping shortage, but once the shipping difficulties are solved (and they will be), the rate of cutting will exceed that of 1939, which exceeded 1938.

In not too many years the familiar barge loads of Douglas fir "peeler logs" from the Pacific coast islands will be a sight of the past. The 12-foot long, stout "peeler logs," cut from the butt of the tree, are top grade lumber.

Tragedy of both Sitka spruce and Douglas fir is that neither achieves its outstanding qualities of strength in much less than 250 years. This slow period of growth, combined with a peculiar system of timberland holding in effect in British Columbia, makes forest "harvesting"—in which the annual cut is limited to the annual growth—appear an impractical dream for these two trees.

Timberlands are not owned outright, but revert to the government when the timber has been cut. The right-holder must pay an annual tax of $140 a square mile as long as the land is not cut and he holds it. He would need rights on simply immense areas to get any harvest at all from such slow-maturing trees. At $140 per section per year, this is not economically feasible. Instead, the timber baron "cuts out and gets out."

Sitka spruce is the victim of still another circumstance. Only between 2% and 7% of the cut yields lumber suitable for aircraft work. Much of the rest is highly useful, but Sitka spruce pulp at the moment is a drug on the market. And in many of its other uses, it could be replaced by a less-threatened wood.

The situation is comparable to killing herds of steers merely to get the filet mignon. The logger can't tell which will be the filet mignon parts while the tree is still on the hoof.

The main remaining stands of virgin Sitka spruce are on Vancouver and Queen Charlotte Islands and in the valley of the mighty Fraser River, which roars through British Columbia into Georgia Strait just south of Vancouver. Sitka spruce stands in the United States are still smaller.

The events in Scandinavia have not markedly affected the demand for coast lumber, as Scandinavia produces mostly pulp. This is lumber country.

The government reforestation program in British Columbia will have put 20,000,000 Douglas firs and also Sitka spruce into the ground. But none of us will be around to see them soar majestically heavenward, almost perfectly straight all the way up and with the first hundred feet of trunk clear of branches. Large forest areas in British Columbia remain untapped but they too will be cut over in time.

Only a changing technology, which is substituting plastic cellulose products for lumber, and thus permitting the wider use of faster-growing trees like cedar and hemlock, will protect 100,000 wage earners in the Oregon-Washington-British Columbia area from loss of their forest source of livelihood. Cedar and hemlock have always bulked large in this region's forestry. They will bulk larger as time goes and the big trees grow fewer.

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