The Mountain Pine Beetle in Alberta.—Safranyik et al. (Environ. Can., For. Tech. Rep. 1, 1974) stated that "the mountain pine beetle (*Dendroctonus ponderosae* Hopk.) is the most serious enemy of mature pines in western Canada." In his revision of the species in this genus, Wood (Great Basin Nat. 23[1-2]:57-69, 1963) stated that the mountain pine beetle occurred from southern British Columbia to the Black Hills of South Dakota, and south to northern Mexico. He gave only a vague account of its distribution in Alberta, recording a specimen from Edmonton and indicating in his Fig. 52 that the probable geographical distribution of *D. ponderosae* included western Alberta. Powell (Dep. For. Inf. Rep. A-X-2, 1966), however, concluded that the Edmonton collection reported by Wood was questionable, because (1) a search in the collection on which this report was based failed to locate the specimen, and (2) there are only a few pine in Edmonton. He went on to note that Wood's probable distribution of *D. ponderosae* in Alberta is much farther north than where any collections have been made and appears to be based on the distribution of the host species. The recent publication by Bright (Agric. Can. Publ. 1576, 1976) on the bark beetles of Canada and Alaska indicated essentially the same distribution for the mountain pine beetle as Wood. The Edmonton collection noted by Wood was, however, excluded, and only in Bright's distribution map is *D. ponderosae* shown to be present in Alberta. This paper brings up to date the status of this insect in Alberta.

The first report of an outbreak of the mountain pine beetle in the province was in the Bow River valley and tributaries near Banff in 1940 (Hopping and Mathers, For. Chron. 21:98-108, 1945). The total area infested was 4 070 ha. The cutting and burning of infested trees in 1941-43, in conjunction with 12 days of subzero weather in the middle of January 1943, apparently reduced populations of the insect to endemic levels. Although the occasional adult of *D. ponderosae* has been collected (Seebe in 1948, north of Coleman in 1969, and southwest of Pincher Creek in 1970), no subsequent infestations were noted in Alberta until 1977.

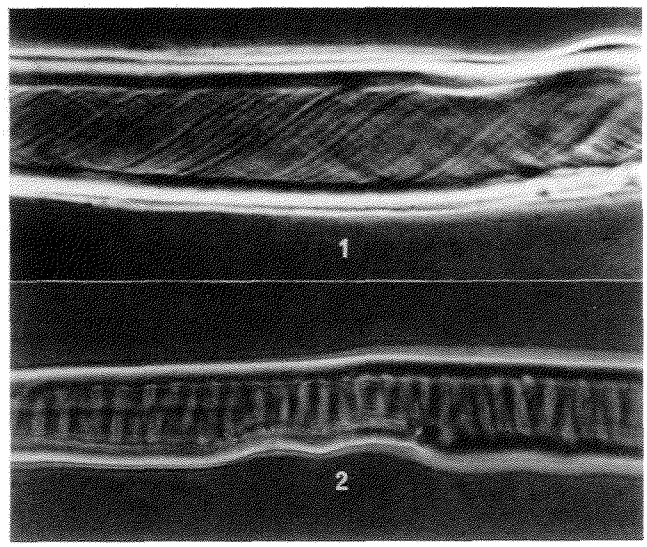
In 1977, adults of the mountain pine beetle were collected, and fresh pitch tubes were observed on green infested trees in Waterton Lakes Forest at Sharp Creek, near the south end of West Castle River, and in and around the Syncline Campground 11.2 km southwest of Beaver Mines. In the last-mentioned area, the presence of several dead trees indicated that the infestation had been present for at least 3 years. Numerous red tops were observed in the Blood Indian Timber Reserve, headwaters of the Carbondale River, and south of Blairmore. This suggests that the infestation is fairly extensive—H.R. Wong and J. Petty, Northern Forest Research Centre, Edmonton, Alta.

MISCELLANEOUS

Tracheids of Boreal and Tree-line Tamarack (*Larix laricina*).—Paleobotanists and wood technologists often have difficulty in differentiating between *Larix* and *Picea* driftwood and subfossil wood samples from the Arctic and Subarctic (Blake, pages 77-104 *in* Proc., Symposium on climatic changes in Arctic areas during the last ten-thousand years, Univ. Oulu, Finland, 1972). This paper describes the structure of tracheids in *Larix laricina* collected from boreal and tree-line locations. The information it gives, supplemented by the anatomical descriptions found in Panshin and de Zeeuw (Textbook of wood technology, third ed., McGraw-Hill, New York, 1970), may be useful to arctic investigators for identifying unknown wood samples.

Specimens of tamarack were collected by S.C. Zoltai, arctic ecologist at the Northern Forest Research Centre, from Smoky Lake, Alta. (54° 15'N and 112° 08'W); Macdowall, Sask. (53° 02'N and 106° 05'W); Newfoundland (49° 08'N and 56° 04'W), in the boreal region; open gallery forest surrounded by tundra at Anderson River, N.W.T. (68° 50'N and 128° 26'W); open black spruce-lichen forest at Mountain River, N.W.T. (65° 33'N and 128° 51'W); forest patch in tundra at Tha-Anne River, N.W.T. (61° 11'N and 97° 09'W); forest patch in tundra at Downer Lake, N.W.T. (60° 31'N and 97°04'W); and the Newfoundland barrens (49° 00'N and 57° 05'W) in the tree-line region.

The tracheid structure of wood samples was examined microscopically in radial and tangential sections to identify the group and tentatively determine the genus. Macerations in a 1:1 mixture of glacial acetic acid and 15% hydrogen peroxide, as well as sections, were used for species identification and confirmation of group and genus. Tree-line tamarack from the Northwest Territories and Newfoundland consistently had thickenings in the summerwood tracheids in growth rings of all specimens.



Figures 1 and 2. Tracheids with spiral thickenings from tree-line tamarack.
Figure 1. Thin, almost 45°-angled spiral thickenings.
Figure 2. Thick, almost right-angled spiral thickenings.

These spiral thickenings were of two kinds: (1) thin, almost 45°-angled, closely spaced (Fig. 1), and (2) thick, almost right-angled, widely spaced (Fig. 2). Type 1 was more common in most tree-line samples except the specimen from Newfoundland, in which both occurred in almost equal proportions.

There were no type 1 spiral thickenings in boreal summerwood tracheids from Saskatchewan and Alberta specimens. Type 2 thickenings occurred intermittently in growth rings of some of these trees. The Newfoundland specimen had both type 1 and type 2 spiral thickenings in all growth rings; type 2 was most prevalent.

Springwood tracheids invariably had spiral checks in the outer wall similar to the one reported by Panshin and de Zeeuw (1970, Fig. 14B). Spiral checks, however, occur at regular or irregular intervals in many species, often open-cleaved, and have little diagnostic value. Composite structures and deformities in tracheids similar to those illustrated from frost burl tissues in pine and spruce (Zalasky, Can. J. Bot. 53:1888-1898, Figs. 20, 29, 33, 35, 37, 38, 1975) are also of no diagnostic value because the anomalies occur in most species.

To determine whether the wood is a species of *Larix* or of *Picea* the diagnostically important characteristics of all cell structures of boreal species lacking spiral thickenings in tracheids must be examined. The variability in the angle and spacings of spiral thickenings in tamarack helps to distinguish this species from other species of *Larix* that have more constancy in the angle and spacing of spiral thickenings. The closely spaced fine spirals are observed more readily in macerations than in sections.—Harry Zalasky, Northern Forest Research Centre, Edmonton, Alta.

INSECT PATHOLOGY

Experimental Aerial Application of *Bacillus thuringiensis* for Spruce Budworm Control.—Slow progress in developing spray technology for the aerial application of *Bacillus thuringiensis* has delayed operational use of this biological control agent against spruce budworm. Accordingly, a test series in which two spray systems were used in two consecutive years, was carried out with small aircraft to develop methodology for spruce budworm control.

In 1976, a concentrated sorbitol—*B. thuringiensis* (Thuricide 32B)—formulation was applied at the rate of 4.7 L/ha to a 40 ha block in a balsam fir stand averaging 30 larvae per 45 cm branch. The formulation was composed of 50 parts *B. thuringiensis* concentrate, 20 parts 70% sorbitol solution, 30 parts water, 1/1600 Chevron sticker, and 10,000 nephelometric units of chitinase/ha. A Sikorsky S-55T helicopter equipped

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