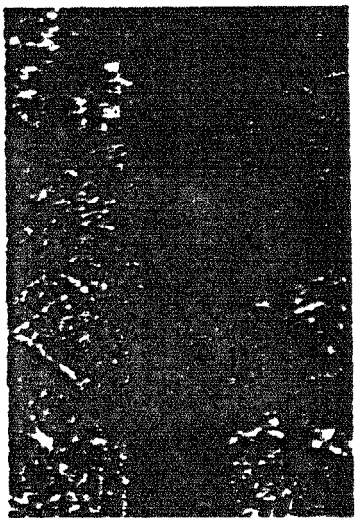
FIGURE 16.—LOGGING WOUND ON YELLOW BIRCH.



A severe old logging wound on a yellow birch. The face of the wound is decayed, indicating decay in the tree.

The cross-section shows the effect on growth of the tree. The 2-inch central hard core of discoloration was already in the tree when it was wounded at 6 inches. The discoloration and decay due to the logging wound did not penetrate the smaller defect column. This is another example of multiple columns of defect in living trees. Just as they do not advance out into new tissues, the discoloration and decay also do not penetrate tissues affected earlier.

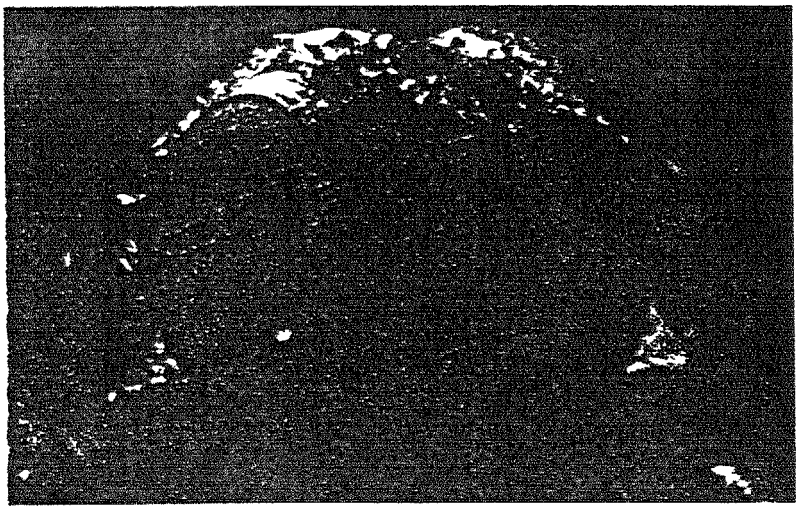
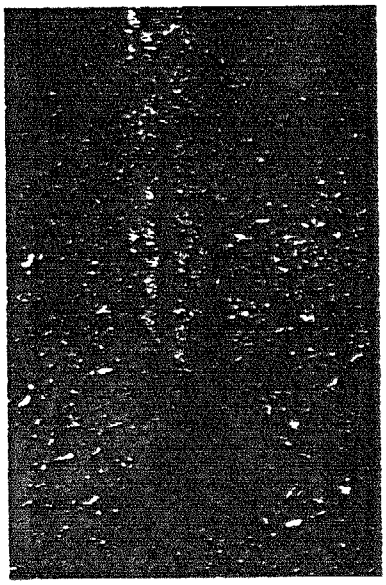
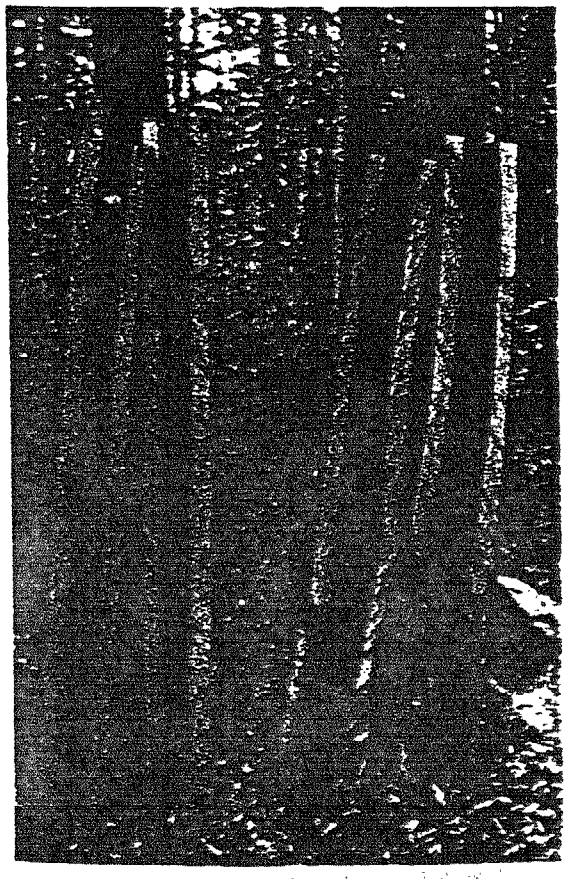


FIGURE 17.—LOGGING WOUND ON PAPER BIRCH.

This 100-year old paper birch has a 50-year-old wound, which extends to the base of the tree. There is a wound of similar size and age on the opposite side of the tree.

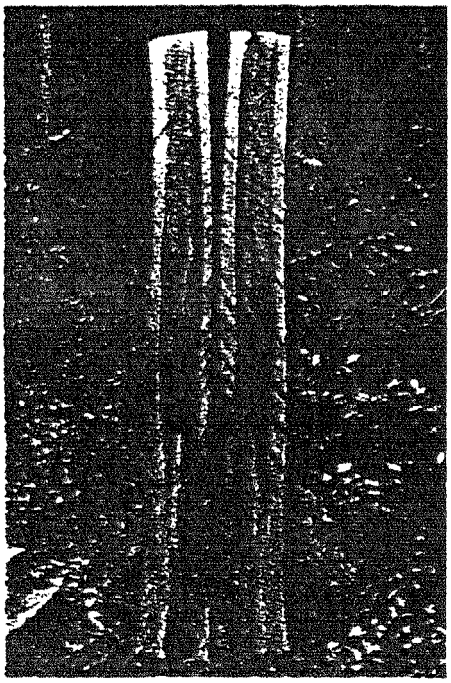




Dissection of the tree to 16 feet. The lower 8-foot section (right) has a 5-inch hollow center. Yet the decay did not go into the new wood formed after the tree was wounded. In the upper 8-foot section (left) the advance of the decay fungus can be seen as dark streaks in the wood.

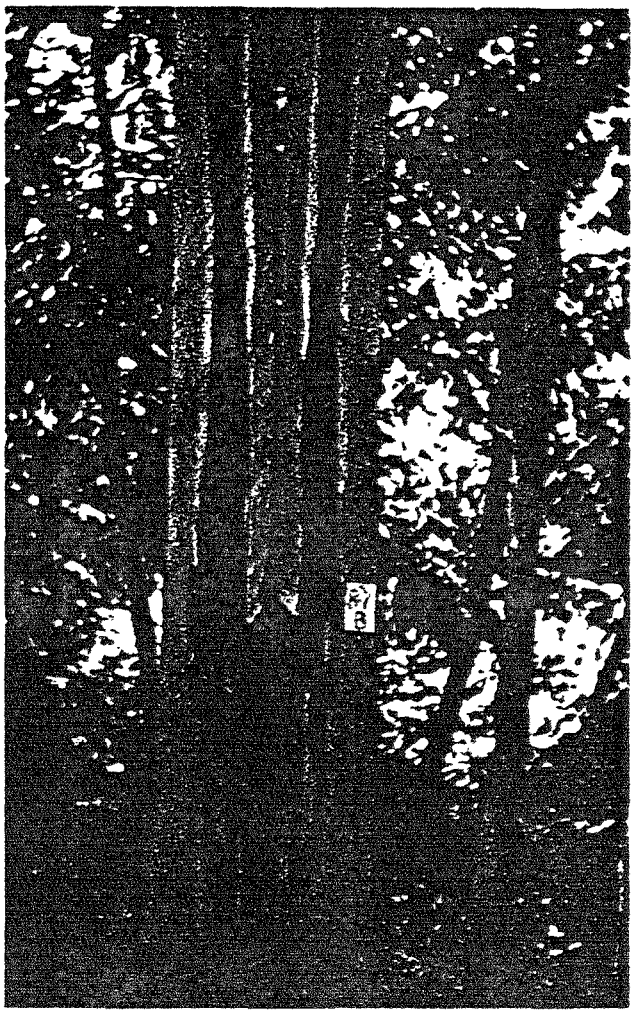
FIGURE 18.—LOGGING WOUND ON BEECH.

A 100-year-old beech tree with a 50-year-old wound, which does not extend to the base of the tree. The hollow behind the wound indicates advanced decay.



Dissection shows that, although the decay is advanced, the base is free of decay. The decay column narrows abruptly above the wound. The boundary of the column is white. The decay advances farthest as a streak above the wound site.

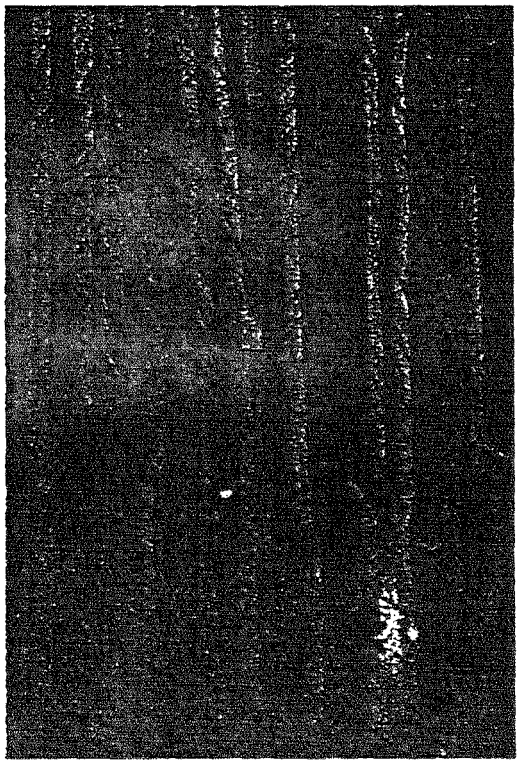
FIGURE 19.—LOGGING WOUND ON BEECH.



This beech tree had a single wound above the base. Dissection shows that the base is clear, but discoloration and decay spread upwards. The decay fungi advanced through tissues first infected by other organisms; and decay was limited to these tissues. A white band surrounds the column of discoloration but not the decay column near the wound. The tissues in the white band contain plugged vessels.

FIGURE 20.—LOGGING WOUNDS ON RED MAPLE.

This red maple has two 8-year-old wounds, the smaller on the left facing the sun, the larger on the right mostly in the shade. The face of the small wound is white; the face of the larger wound is dark. Dark wound faces indicate more defect than light wound faces.



Dissection shows the difference on the lower 8-foot section at left. Very little defect is associated with the small white wound. But the defect caused by the larger dark wound meets the central column of discoloration from the branch stubs. In the upper sections of the tree, the larger branch stubs give rise to dark, moist discoloration and decay. Many stages of discoloration and decay processes can be present in the same stem.

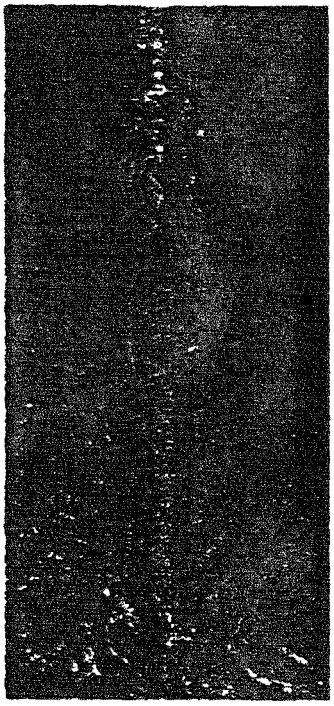
FIGURE 21.—WHITE-FACED WOUND.

This white-faced wound, on a sugar maple with well-healed branch stubs, indicates very limited defect. The face of such a wound is hard, and often has tan streaks.

Cross-sections through the wound and directly above it show that the defect was limited to the wound area and did not advance above it. The discoloration did not go into the tree center. The small central defect column indicates that the tree lost most of its branches when it was about 3 inches in diameter. The white zone around the central dark columns contains wood with plugged vessels. These tissues are drier than the other tissues.

FIGURE 22.—WELL-HEALED SMALL WOUND.

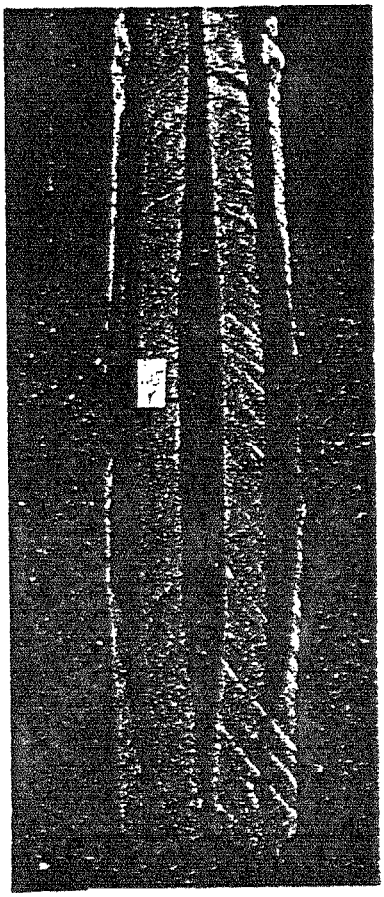
This yellow birch has a well-healed wound at 5 feet. On vigorous trees shallow narrow wounds like this heal fast. Areas of smooth bark should be checked to determine whether a wound is present.



Dissection shows that hard dark tissue and wavy grain are associated with the wound. The large central defect column indicates that many branch stubs did not heal till late in the life of the tree.

FIGURE 23.—OPEN WOUND.

An open 9-year-old wound on a yellow birch with well-healed stubs. The callus and healed stubs indicate a vigorous tree.



Dissection reveals redheart associated with the wound. The infected tissues are dark red, moist, and contain decay organisms. The defect column narrows abruptly as it approaches the base of the tree. A well-healed stub is present several feet above the wound.

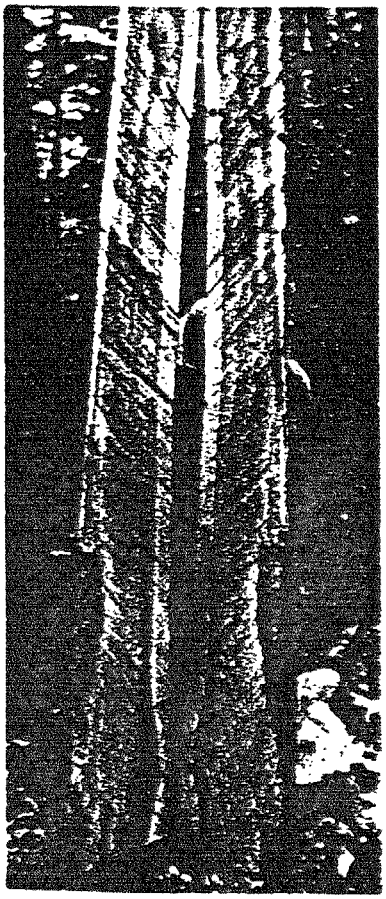
FIGURE 24.—ROUGH DARK WOUND.

This sugar maple has an 8-year-old wound. The callus tissue is healthy. But the face of the wound is rough, dark, and splintered; and this indicates that the defect may be serious.

Dissection shows decay typical of *Hypoxylon rubiginosum*. The dark, moist column of discoloration is wetwood or blackheart; it extends up to a branch stub at 8 feet. Note that the decay is advancing through the discolored column. In cross-section the defect area is wedge-shaped.

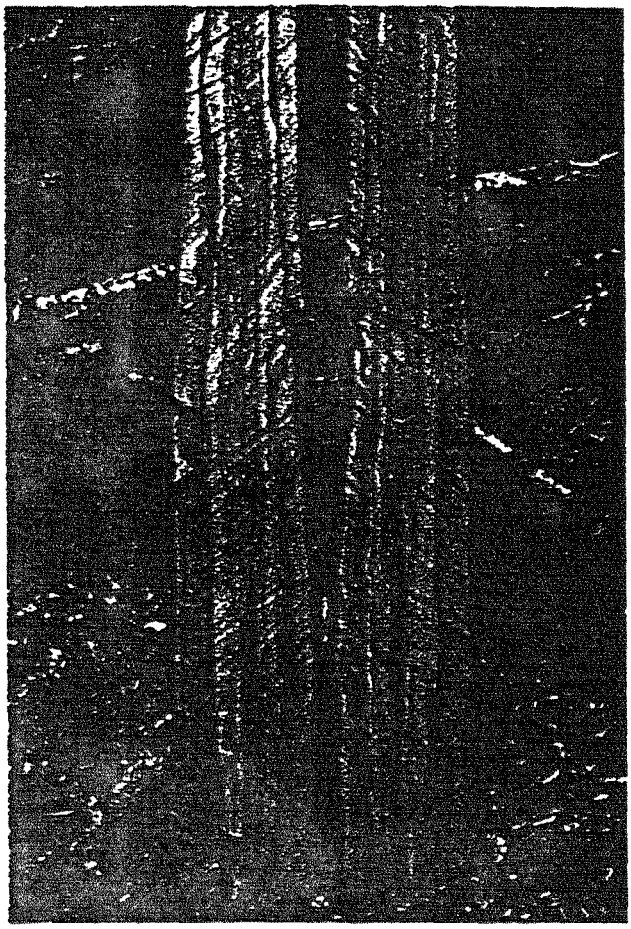
FIGURE 25.—*FOMES APPLANATUS* ON WOUND.

This beech tree has a large basal wound on which can be seen fruit bodies of *Fomes applanatus,* which indicates advanced decay, extending to base and roots. In beech, this is the principal fungus that infects the base. The face of the wound is dark and rough.



Dissection shows that decay extends from the base to 4 feet above the wound, where it ends abruptly. The central column of defect is very wide; this is due to the large wound and the infection of the tree base by *F. applanatus.*

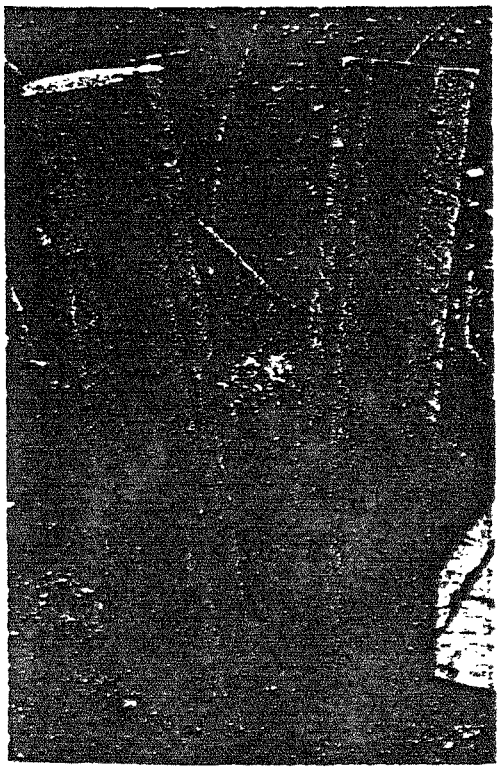
FIGURE 26.—*FOMES IGNIARIUS* ON WOUND.



This beech tree had a fruit body of *Fomes igniarius* at 4 feet. Dissection reveals that decay is extensive above, where it meets defect columns from branch stubs, and narrows toward the base. The decay column is surrounded by a dark band, which is moist and contains other organisms. In the lower section is a smaller defect column that formed when the tree was young. The later defect column enveloped this small column, but *F. igniarius* did not penetrate this small column.

FIGURE 27.—*FOMES IGNIARIUS* VAR. *LAEVIGATUS.*

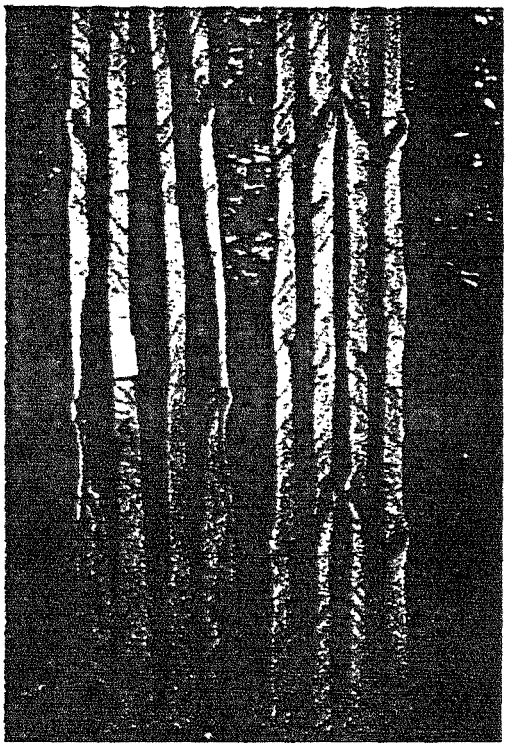
A 160-year-old yellow birch with a 60-year-old logging wound. The wound surface bears flat brown fruiting bodies of *Fomes igniarius* var. *laevigatus.*



Dissection shows that the decay caused by *F. igniarius* var. *laevigatus,* even after 60 years, has hardly penetrated the central column of discoloration that was formed before the wound occurred. Note that the discolored margin of the decay column is only on the wound side.

FIGURE 28.—*POLYPORUS VERSICOLOR* ON WOUND.

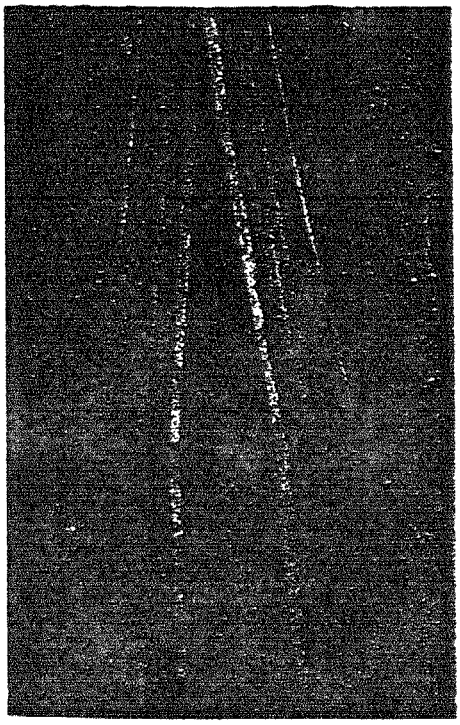
This yellow birch has a severe 8-year-old basal wound bearing fruit bodies of *Polyporus versicolor*. This is one of the first decay fungi to invade the dead wood on the face of a logging wound. The fruit bodies, the dark wound surface, the splintered wound face, and the poorly healed stubs indicate much defect.



Dissection to 16 feet shows the decay caused by *P. versicolor* on the lower margin of the wound, the decay caused by another fungus in the interior of the tree, and the central column of discoloration and decay associated with the branch stubs. The darker discolorations on the sections at left indicate wetwood or redheart.

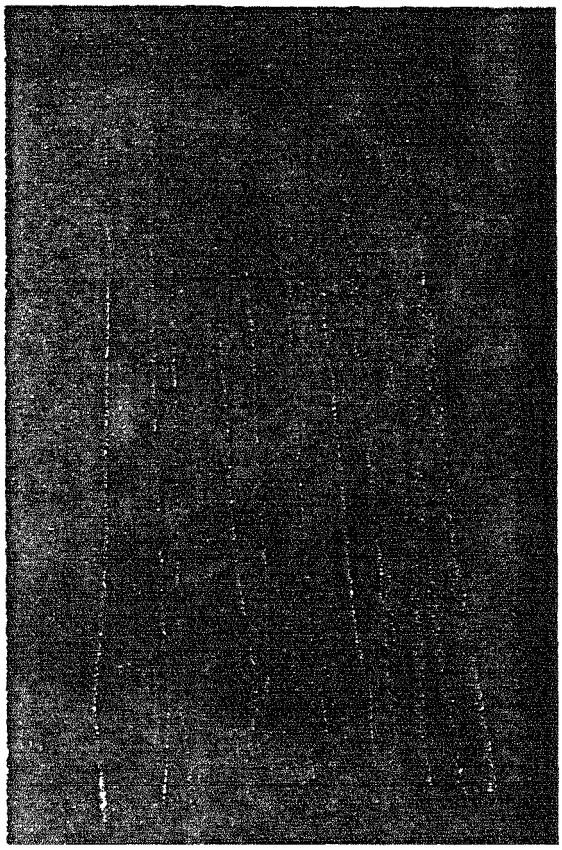
FIGURE 29.—*PORIA OBLIQUA ON* OLD WOUND.

This is a sterile conk of *Poria obliqua* on an old basal wound on a paper birch. The orange-tan ooze below the conk indicates moist decay. *P. obliqua* infection causes the tree stem to swell so it resembles a bowling pin. A tree with this type of swelling can be identified at a glance as being infected with *P. obliqua.*



Dissection shows advanced decay caused by *P. obliqua.* The decay is darker and moister above the wound. This fungus can kill trees. It kills the bark slowly, and enlarges the wound. The fertile fruit body forms in the wood beneath the bark of dead standing trees. Trees infected with *P. obliqua* should be felled and left on the forest floor.

FIGURE 30.—BOWLING PIN EFFECT FROM *PORIA OBLIQUA.*



Dissection of this paper birch to 24 feet reveals the typical bowling pin swelling (butt sections, at left) caused by *Poria obliqua.* Note the range in color. The butt section at left is bright orange-tan, the middle section is tan, and the upper section (right) is light orange to pink. The discoloration and decay are most advanced at the base. The dark rims of earlier defect columns are obvious. As *P. obliqua* kills tissues about the wound, enlarging it, and as new branch stubs form, new columns form and envelop those formed earlier.

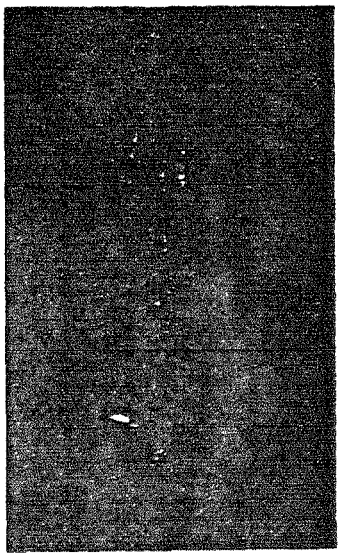
FIGURE 31.—OPEN WOUND BY SUGAR MAPLE BORER.

When injury by the sugar maple borer is severe, large open wounds result. Then the galleries made by the borers can be seen on the wound face. The sugar maple borer (*Glycobius speciosus*) has a 2-year life cycle; and in that time it normally bores in a spiral path to the center of the tree and then bores its way out again. A number of events can halt a borer; and the severity of the wound depends upon how much of its gallery the borer completes.

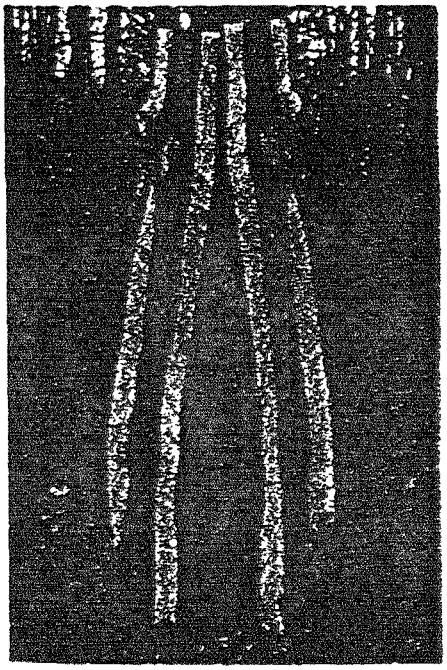
FIGURE 32.—SELECTIVE ATTACK BY BORER.

The sugar maple on the right was injured by the sugar maple borer at many points on the bole, but the tree on the left was not touched by them. This is common, but we do not know why. The injury done by the borer may be minor, causing no more than a small bump on the bark; or it may be a major wound, exposing the wood and the borer galleries. In an area where borer injury is common, small bumps on the bark may be signs of small aborted borer galleries. Discoloration, decay, and twisted grain are associated with these wounds.

FIGURE 33.—*FOMES CONNATUS* FRUIT BODY AND BORER WOUND.

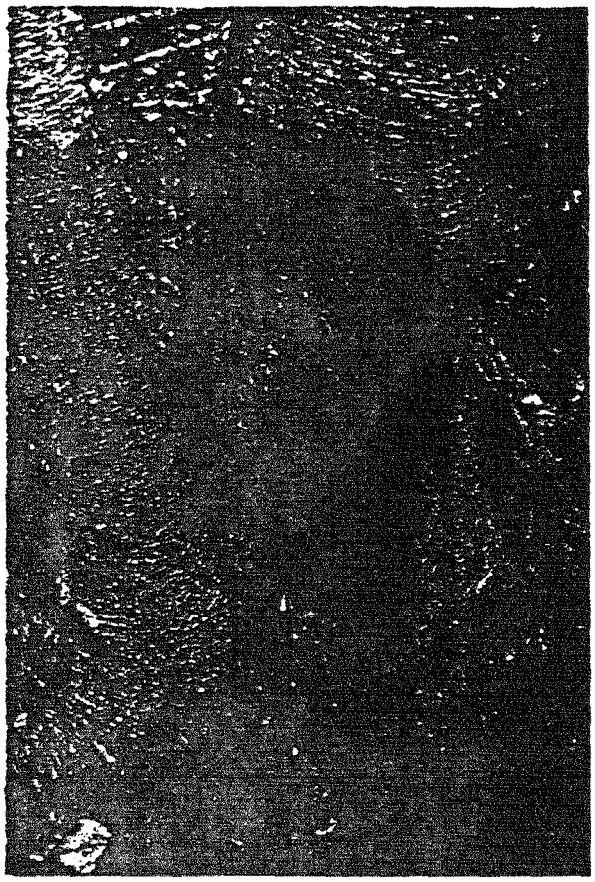


The large fruit body on the face of the old basal wound on this sugar maple is *Fomes connatus*. It is typically white and moist, and has green moss on top. Above it is a large open wound caused by a sugar maple borer. Borer wounds can be found on all parts of the stem. These beetles apparently are attracted to the trees left after logging. We do not know whether it is the open condition of the stand or the stress after logging that favors borer infestation.



Dissection shows that the sugar maple borer attacked the tree soon after it was wounded at the base. The decay due to *F. connatus* is dark brown to black, and moist. The decay is advanced, but ends a short distance above the fruit body. Another decay fungus is advancing downward from the borer wound. The diameter of the defect column indicates the diameter of the tree when it was wounded.

FIGURE 34.—*ARMILLARIA MELLEA* INFECTING BASE OF PAPER BIRCH.



The wet orange-brown ooze at the base of this paper birch is a good indicator of *Armillaria mellea* infection. Here the bark was chipped away to show the dead area at the base of the birch and the plates of white fungus tissue. This fungus usually advances upward from the roots. Infected trees should be harvested as soon as possible.

This fungus may act either as a cambium killer, as shown here, or as a root and butt rotter, as shown in the three photographs that follow.

FIGURE 35.—COLLAR CRACK OF PAPER BIRCH.

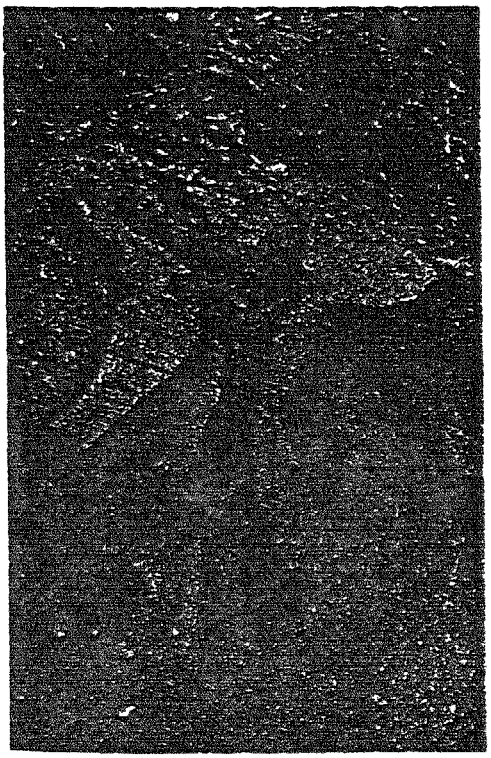
In yellow birch and paper birch, *Armillaria mellea* infects the roots, and cracks form at the base of the trees. Once the cracks form, other decay fungi have easy access to the bases of the trees. Usually fungi that are more aggressive than *A. mellea* above the base enter at these openings. Once this occurs, the base decays fast. Such trees should be cut as soon as possible.

FIGURE 36.—HOLLOW BUTT CAUSED BY *ARMILLARIA MELLEA.*

Dissection of this beech tree shows a hollow butt (left) caused by *Armillaria mellea* advancing upward from the roots. The hollow in the upper section (right) was caused by other fungi advancing downward from branch stubs. If you see only the ends of logs, and both ends have hollow centers, you might guess that what you see is all one defect from one cause. Often this is not so. Butt decays often end abruptly in northern hardwoods.

FIGURE 37.—*ARMILLARIA MELLEA* ROOT DECAY.

The fruit body of *Armillaria mellea* at the base of this beech tree indicates root and butt decay. Fruit bodies like this can be found only in the fall. Cracks on roots and wet spots usually indicate root decay.

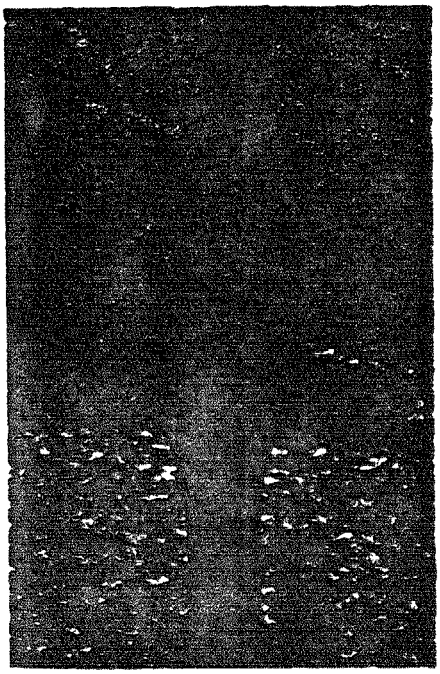


Dissection shows that both the butt and root are decayed. In early stages the infected wood is dark brown and very moist. Dark zone lines are common in the dark discoloration and decay. In later stages *A. mellea* decay is moist, bleached, and stringy. The fungus produces black ropy strands of mycelium that resemble shoestrings — hence the name shoestring fungus. Other organisms, especially bacteria, are associated intimately with *A. mellea*.

FIGURE 38.—NECTRIA CANKER ON PAPER BIRCH.

This target canker on a paper birch tree is caused by *Nectria galligena*. Such cankers usually begin at branch stubs. The face of the canker is hard and light in color. Very little discoloration is associated with these cankers; it may go only a few inches above and below the canker. The cankers themselves are highly decay resistant—except in trees also infected with *Poria obliqua*. Sapsuckers often tap the stem above the canker. These cankers are common on trees on poor sites, especially dry mountain tops.

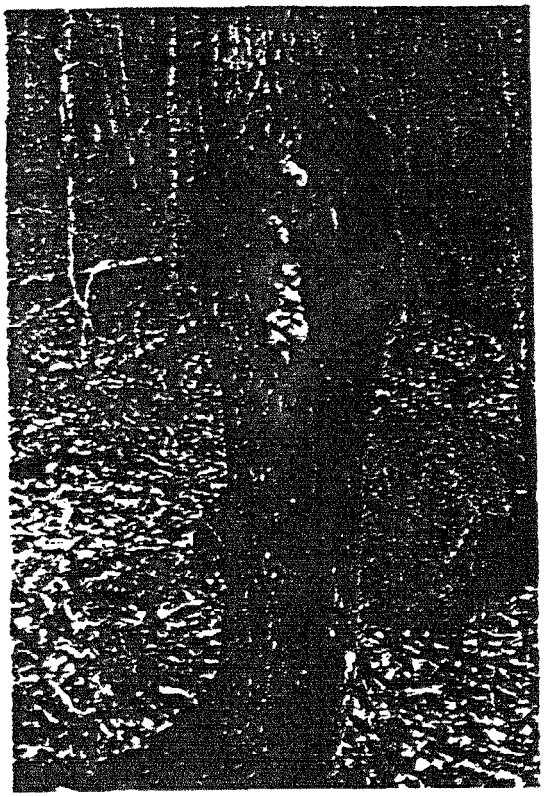
FIGURE 39.—NECTRIA CANKER ON SUGAR MAPLE.



A Nectria canker on a small sugar maple. The bark is broken and the hard white surface of the wood is exposed. The minute red fruit bodies of the fungus can be found in these cankers. In some stands such cankers are common.

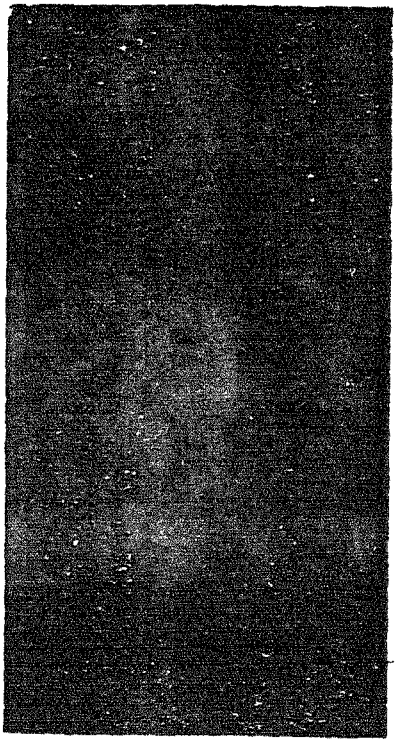
Dissection shows that discoloration is limited: it does not extend far above or below the canker. The wood in the canker is very dense and heavy. This canker formed below a stem stub.

FIGURE 40.—DECAY FUNGI IN CANKERS.

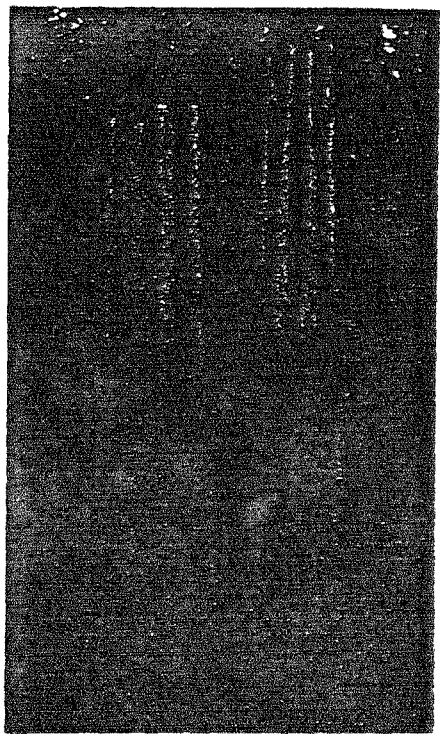


The canker on this sugar maple has been infected by decay fungi. Though decay fungi will infect some cankers, the advance of decay is very slow. *Fomes connatus* is one of the fungi that infect such cankers on sugar maple.

FIGURE 41.—*EUTYPELLA* CANKERS ON SUGAR MAPLE.

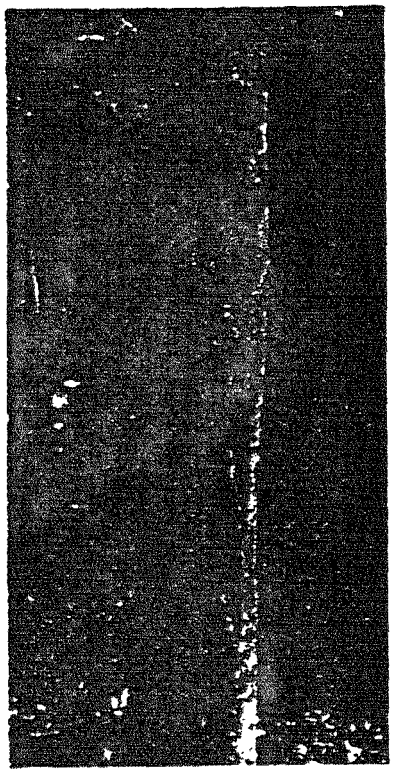


Eutypella parasitica caused the cankers on these two sugar maples. Decay by other fungi followed. The fruit body of *E. parasitica* is minute and black, and has a neck about 1/4 inch long.



Dissection shows that the cankers and the unhealed stubs have made these two trees worthless. However, the defect associated with the cankers alone is very slight. Stems often break at canker sites.

FIGURE 42.—OTHER CANKERS ON SUGAR MAPLE



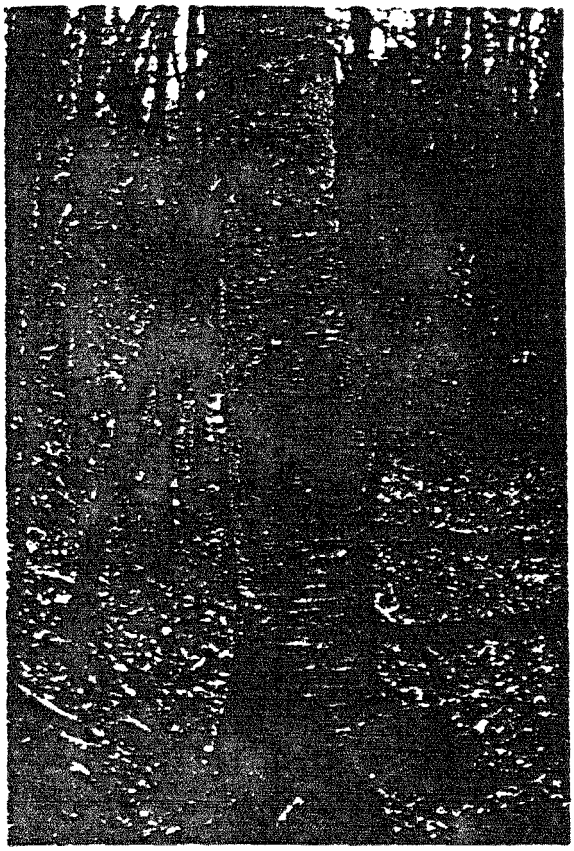
A canker of unknown origin on a sugar maple. Such cankers are very hard. They are usually found at branch stubs. They are similar to those caused by *Polyporus glomeratus*, except that no sterile conk is present.

Dissection shows that very little defect is associated with this canker. When in doubt about a canker like this, cut it open with an ax: if you find no sterile conk, the defect will be limited to the canker area.

FIGURE 43.—STEM SWELLINGS.

This sugar maple tree had two healed swollen areas near the base. Dissection shows very little defect. When such areas are healed tightly, very little defect is associated with them. Note that the central column of discoloration narrows abruptly toward the base. This kind of stem swelling is common in some areas.

FIGURE 44.—SUNKEN STEM CANKER.



This sunken stem canker on a paper birch is caused by *Fomes igniarius* var. *laevigatus*. These sunken cankers are most common on mature and overmature paper birch and yellow birch trees. They indicate advanced decay—especially on trees with large poorly healed stubs. The fruit body resembles a flattened fruit body of *F. igniarius*.

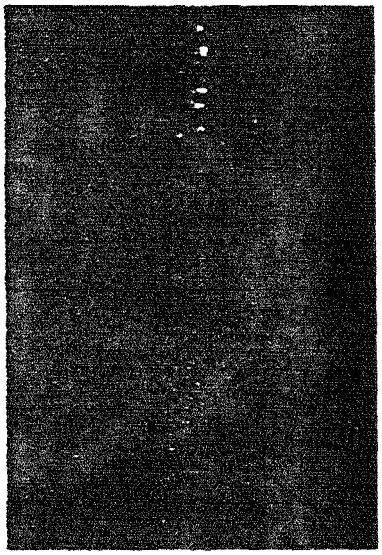
FIGURE 45.—STEM BURL

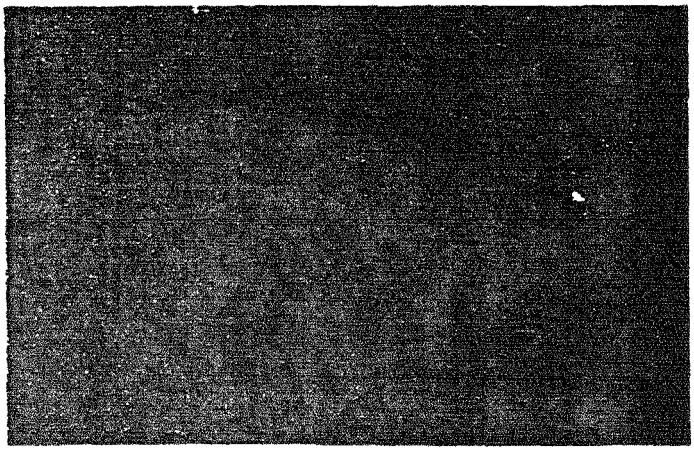
A stem burl on an ash tree. Burls and large swollen areas — often called tumors — can be found on all northern hardwood species. The bark is usually intact.

Dissection shows very little defect is associated with burls like this—unless the bark is broken; then decay is often present. Wavy grain is usually found a short distance above and below these abnormal growths. The cause of these burls is not known.

FIGURE 46.—FUSIFORM SWELLING.

Fusiform (spindle-shaped) swelling on the stem of a yellow birch. The bark is rough, thick, corky, and dark on these swollen areas. Swellings like this are also found on other species of northern hardwoods.

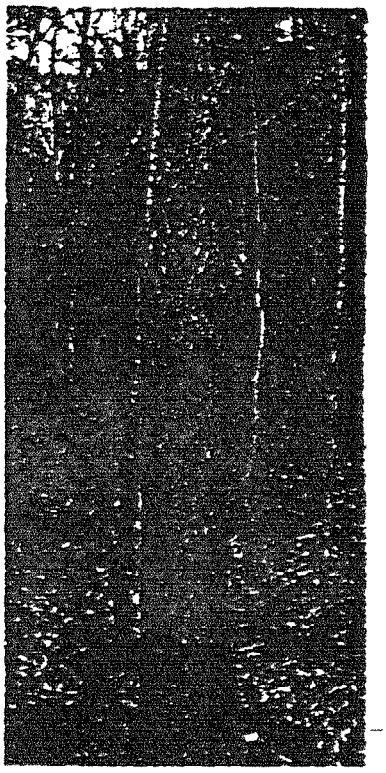




Dissection shows very little defect, except hard dark spots in the wood and some wavy grain a short distance above and below the swelling. However, if an ooze is found on the swollen area, you can expect extensive discoloration. The cause of such swelling is not known, but a disease of the outer bark after it has been wounded is suspected.

FIGURE 47.—CORKY BARK.

This sugar maple has a swollen area, with rough corky bark. The wood is not exposed as in Nectria cankers. Bark insects are common in the corky bark. Such trees are often found in clusters.



Dissection shows that only slight discoloration is associated with the swollen area under the corky bark. The wood is dense and hard, and often separations occur between some of the growth rings.

FIGURE 48.—LARGE BURLS.

Large burls can be found on all northern hardwood species. This one is on a yellow birch. Very little defect is associated with these large burls as long as the bark is tight. Trees with burls like this are often found in clusters.

FIGURE 49.—SEAM OR FROST CRACK ON PAPER BIRCH.

The black band on this paper birch marks where cracks formed above and below a wound. The white bark usually falls away from such areas. (This should not be confused with the black bands that form after bark has been stripped off.) The cracks have lips that open in winter and close in summer. Seams or frost cracks often begin at wounds and branch stubs. Discoloration is associated with all cracks, and sometimes decay is too.