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"NEW" IDEAS IN TREE CARE

by Alex L. Shigo and Walter C. Shortle[1]

Abstract. Some controversy has arisen over statements made recently in this JOURNAL about wound dressings, cavity fillings, and boring holes in trees. Some quotations from other researchers are given here as support for the statements. Often what is considered new is really a restatement of older information. Or sound older information may be combined with information from recent studies to form conclusions that can be considered new.

There is nothing new under the sun, and nothing worthwhile ever happened without some controversy. Some controversy has arisen over certain "new" ideas in tree care presented in this Journal recently (Shigo 1975). Three subjects are of particular interest: wound dressing, cavity filling, and boring holes to let water out of cavities.

In this paper we offer some quotations from the literature that help to support our recent statements on these subjects.

Wound Dressings

The controversial statement was: "If the situation is such that some sign, such as paint, is needed to show that the job has been completed, then add a thin coat of some wound dressing; but otherwise, do not paint the wound. The commonly used wound dressings to little to stop decay." (Shigo 1975.)

Quotations from the literature:

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". . . the ideal dressing for a wound is yet to be discovered." (Collins 1934.)

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"More than one hundred different substances were applied to test their effects on callusing. Such materials included numerous proprietary preparations and commercially branded paints and other products especially manufactured for tree work, roofing processes, and wood preservation. They varied in consistency from very thin liquids to stiff pastes. A major part of the branded mixtures contained asphalt, tar or creosote. In addition to those already mentioned, a number of the more common paints were used, including aluminum paint, copper paint, metallic roof paint, white lead, and zinc oxide. Shellac mixture, spar varnish, lacquers, pharmaceutical collodion, and liquid rubbers were also tested.

"Of the numerous materials tried, the majority proved to have such a deleterious effect on callus production or to be so impermanent that they were eliminated from further trials. Of those remaining, it was still necessary to further test their effectiveness in preventing checking and decay. In all but small wounds this preservative effect is of greater importance than is the requirement that the material should not be so toxic to the growing layer of callus as to prevent its healing over the margin of the cut. The effects of most of the dressings used in these tests show up prominently. Many were injurious to the growing layer at the margin of the cuts. This is particularly true of most of the oils, tars, and creosotes. Thick, heavy, asphalt-base dressings of the asphalt-putty type tended to foster the development of excellent callus formation, but this type of dressing markedly stimulated the decay of the wood rather than retarded it." (Marshall 1932.)

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"Generally speaking, the asphalt type of dressing to which no creosote has been added

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Figure 1. The fruit body of the decay fungus, *Polyporus squamosus* indicates decay associated with the wound that was well painted with an asphalt dressing. The cracks on the wound surface allow easy access for microorganisms. The hard surface of the wound makes it appear that the wood beneath it is sound, yet it is not.

allows the cut to produce an excellent callus. On the other hand, asphalt used alone or mixed with creosote and applied to wounds that are not sterilized before being dressed, often fails to prevent infection. Applied in very thick coatings, asphalt not only frequently blisters but also appears in many cases to stimulate decay rather than to retard it." (Marshall and Waterman 1948.)

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"The results of my study support the work of Howe, Marshall, McQuilkin, and Young and Tilford who conclude that while wound dressings may prevent dieback of the wound margin, not one wound dressing used was of appreciable benefit in increasing the rate of wound healing. Continued use of wound dressings may be justified, however, on the basis of the protective barrier formed to resist invasion by wood-rotting fungi." (Neely 1970.)

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"Effects of an asphalt varnish paint containing one or more fungicides on the growth in pure culture of several fungi causing decay of wood of shade trees are reported here.

"The fungi grew vigorously on both malt- and potato-dextrose agar. Generally they covered the entire surface of the agar by the end of the observation period. However, the several species grews at different rates. When asphalt varnish without added fungicide was put on the agar, radial extension of the colonies was not retarded or only slightly retarded. The fungi grew up to or over the non-antiseptic paint in most cultures. The formulation containing 0.25 gm of phenyl mercury nitrate in 99.75 gm asphalt varnish was the most effective in inhibiting growth of the test fungi. None of the other formulations retarded growth of all the fungi." (May and Palmer 1959b.)

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"*Ceratocystis fimbriata* f. *platani* can be spread from tree to tree in non-antiseptic asphalt tree wound paint." (May and Palmer 1959a.)

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Cavity Filling

The controversial statement was: "When removing decay in preparation for filling cavities, take great care not to break the inner compartment wall that separates the decay in the cavity from the surrounding healthy wood. If this compartment wall is broken, decay will spread into the healthy wood that surrounds the decay." (Shigo 1975.)

Quotations from the literature:

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"The skilled tree expert takes great pride in his cavity work. He finds its exact execution so vital to his professional standing that he resents even minor criticism of its material, method, or efficacy. Excavation has for its object the removal of splintered, insect-eaten, or decayed wood in order that infection may be prevented, or its advance checked while the tree is closing the wound over with healthy tissue; almost all agree that crumbling and completely decayed tissues should be taken out, but following its removal the operator must often attempt to choose between the lesser of two evils; to leave sound infected wood, or to remove so much wood as to enlarge the cavity sufficiently to weaken the part physiologically and structurally. Fungus mycelium often penetrates deeply into the wood and in its incipient stages can only be detected by microscopic examination following sectioning and staining. Such procedure is not practical in the field. Hence, there is a marked tendency for many practical workers to attempt to remove only wood that is completely decayed and then to treat the cavity with creosote, bichloride of mercury, copper sulphate, or other preparations in the hope of killing the advanced mycelium. Unless there is elasticity the filling becomes broken or crumbled, or grinds away the margin of wood adjacent to it. Such defects permit the entrance of rot-producing fungi. The search for cavity fillers that meet such exacting demands has not been free from controversy. In fact, it has at times been characterized by some degree of personal acrimony. It might be said that the present day pinnacle in cavity filling has been attained after a jolting donkey ride. Those who have survived the ride point out to their followers that success is to be won not by choice of the particular donkey ridden but by learning the idiosyncrasies of the particular donkey so well that he may be ridden even when he is inclined to show stubborn spells.

"In tree cavity work we must judge merit by the results obtained. We must demand a high standard of technical skill. Without it the best of materials may not only prove worthless, they may be injurious." (Marshall 1935.)

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"Theoretically, excavation should be continued until the exposed wood is sound and entirely free from infection. In actual practice, it is difficult or impossible to determine how far the nycelia of the rot-producing fungi extend into apparently sound tissue. Some fungi extend lengthwise a foot or more beyond visible decay. For this reason, it is generally advisable to remove a certain amount of the undiscolored wood, if this can be done without structurally weakening the part involved or unduly subjecting it to drying by the removal of all but a shell of sound sapwood. It is often impracticable to remove all of the infected wood. Numerous materials including cement, magnesite, rubber, and wood are used for fillings. The proper application of any of these materials improves the appearance of the tree and supplies a surface over which the new growth can be spread. However, in the hands of the uninitiated, cavity filling is often injurious rather than beneficial." (Marshall 1951.)

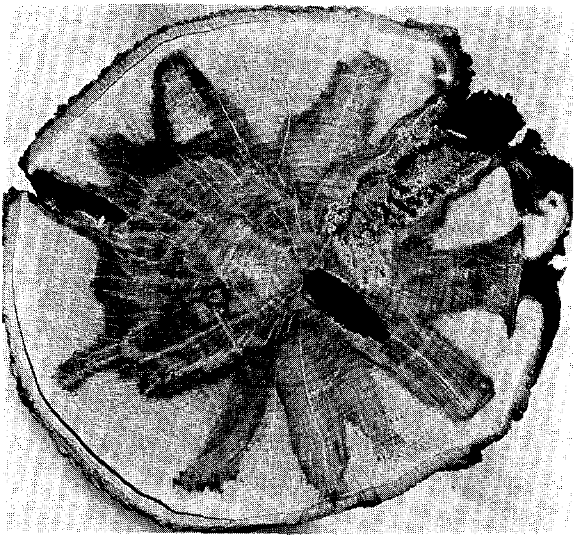

Figure 2. Decay and cambial wound dieback associated with drill wounds in a young sugar maple. The drill holes are used for tapping maples. When too many taps are put into some trees, serious decay can result. Sometimes the tree can be killed when the cambium around the wound dies in large coalescing patches.

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Boring Holes in Trees

The controversial statement was: "Do not bore holes in a tree to let out water from a cavity. The holes will start new columns of decay. It is only because the hollow is separated from the healthy wood by the tough compartment wall that water remains trapped!" (Shigo 1975.)

The quotations cited here give information from increment-borer studies. The drill hole made by the borer is similar to the hole made for draining

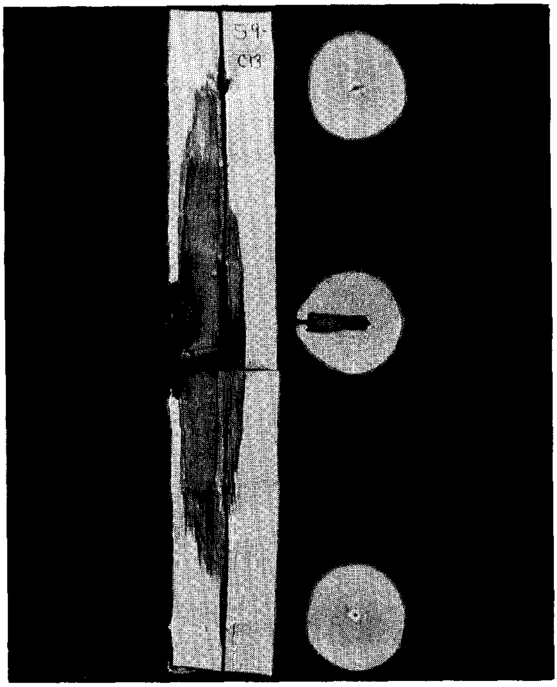

Figure 3. Column of discolored and decayed wood associated with one 5-year-old drill wound, plugged with a sterile dowel, in a sugar maple. Note the cambial dieback above and below the wound. Plugging drill holes in trees will not stop discoloration or possible decay.

water from a cavity and similar to many injection wounds.

Quotations from the literature:

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"Keep your increment borers out of black walnut trees of all sizes. During the first growing season after boring, the wounds produced much exudate which supported the growth of some saprophytic organisms. For the next year or two a large patch of cambium died, mostly below the borer hole. The wounds have begun to heal but some of them are at least an inch wide and up to 18 inches long." (Clark 1966.)

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"Two years after the holes were bored, fewer plugged than unplugged holes were callused over in basswood and yellow birch. A larger percentage of the wounds healed in sugar maple than in any other species, only about 5 percent being still open after 2 years. Cankers around the opening of the borer holes usually would

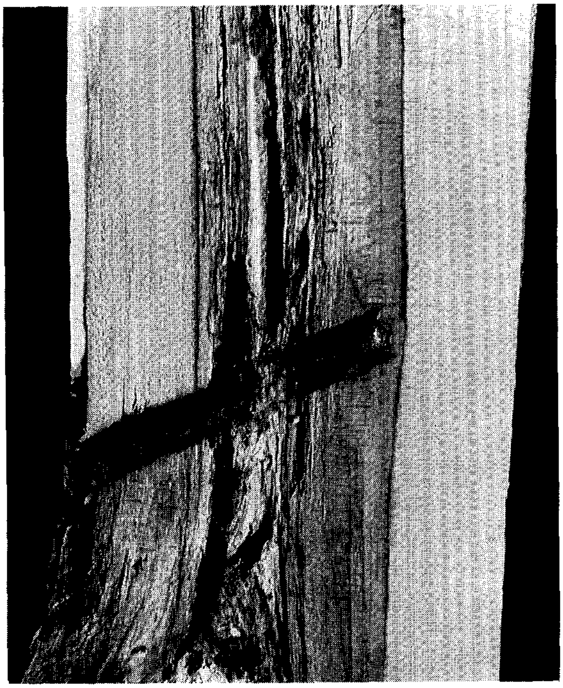

Figure 4. The hole drilled into a column of decay in a red maple started a new column of infected wood. The cambium died above and below the hole.

preclude healing of the wound, and also would increase the opportunity for infection by decay fungi. Decay fungi, especially those causing typical heartrot, would continue to grow from year to year and eventually might cause severe damage to the individual trees." (Lorenz 1944.)

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"This paper reports a study of the amount of stain and decay that developed from increment borer holes in five species of bottomland hardwoods. Though the 0.2-inch holes made by the conventional borers are often considered insignificant, it appears that they may result in serious defect. When sound as well as rotten holes were considered, a "t" test found that sweetgum had significantly more rot than all other species; sugarberry had significantly less than sweetgum and more than the others; cottonwood significantly less than sweetgum and more than ash and Nuttall oak. The last two species were not significantly different." (Toole and Gammage 1959.)

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"At the end of 10 years half of the yellow birch borings were still open as a result of Nectria cankers. The invasion of the injured bark of most of the diffuse-porous hardwoods by species of Nectria not only delayed healing, but increased considerably the local defects and exposed the trees to decay. In some cases, perennial "target" cankers were produced, and in yellow-poplars in the lower crown classes these cankers killed trees.

"In the southeastern study, the holes were slanted various ways to catch or to drain water. In no species was there any significant difference in the amount of discoloration or decay between holes slanted upward or downward, or made horizontal. While, in general plugging had little good effect, it has some definite disadvantages. Unless the plugs were hammered flush with the cambium, closure was delayed. Hammering flush tended to injure the cambium. If the dowels fitted tightly and were dry when inserted, they swelled later, and in many instances this swelling split the trunks for several inches. Disinfecting the borer prior to use had no ultimate effect on internal discolorations or decay in either the Lake States or Pennsylvania studies. Most of the diffuse-porous hardwoods developed cankers at increment borer holes." (Hepting, Roth, and Sleeth 1949.)

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"Considerable discoloration and localized decay were found in beech, paper birch, yellow birch, and sugar maple. Less damage was found in basswood and red maple. These northern hardwoods with thin bark developed rather extensive trunk wounds which were frequently infected by Nectria, especially on suppressed and intermediate trees. This condition was also striking in yellow-poplar in the southern Appalachians." (Campbell 1939.)

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"An analysis of variance showed that plugs did not affect discoloration, decay or wound closure in either species. Treatment with chemicals did not significantly (statistically) affect hole closure. After 3 years no differences either in the species of microorganism isolated or in frequency of their isolation were attributable to either plugging with dowels or to treatment with chemicals." (Houston 1971.)

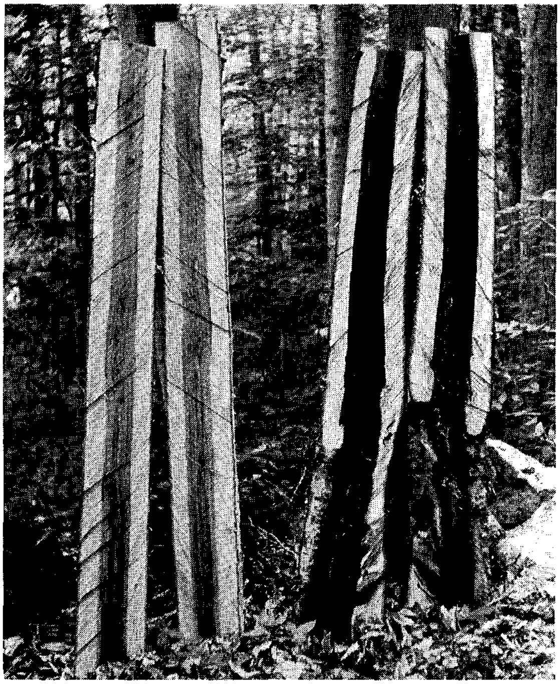

Figure 5. The diameter of the hollow in the lower 8-foot section of the paper birch, and the diameter of the column of discolored and decayed wood in the upper 8-foot section, were the diameter of the tree when it received two large, severe basal wounds 50 years ago. When filling cavities in trees, great care should be taken to cause as little damage as possible to the hard rim of wood that separates the decay from the sound wood. Trees have effective systems for compartmentalizing injured and infected tissues.

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Conclusions

Indeed there is nothing new under the sun.

The quotations presented here were taken from publications by outstanding tree pathologists. Often, what is considered new is really a restatement of older information. Or sound older information may be combined with information from recent studies to form conclusions that can be considered new.

It should be stated, however, that some internal decay resulting from treatment would be better than no treatment and a dead tree. But even this point has another side: any treatment that "saves" the tree but also initiates decay processes may cause that tree to become a hazard to property and people later. This could occur , for example after improper filling of a cavity.

In the end, what is done will depend mostly on the wishes of the tree owner; but in many cases, the tree owner depends on the professional tree expert. And the tree expert should depend on research for sound information. Researchers in turn must be aware of the literature and constantly on the alert to treatments that could harm, rather than help, the tree.

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SAFETY AND PRECAUTIONS AROUND OVERHEAD WIRES AND UNDERGROUND CABLES[1]

by Richard E. Abbott

The Occupational Safety and Health Act of 1970 (Williams-Steiger Act), Public Law 91-569, became effective April 28, 1971. Very few pieces of legislation have affected so many people, employers and others, in its efforts to achieve safer and healthier work places throughthe nation and to preserve our human resources. Every employer engaged in a business affecting commerce is required to furnish a place of employment free from recognized hazards that are likely to cause death or physical harm.

The term "employer" does not include federal, state or local government employers.

The Secretary of Labor is required to promulgate mandatory federal safety and health requirements applicable to all employers.

Three types of safety standards are provided for in the act:

1. Interim Standards (Section 6A). Congress recognized that development of safety and health standards for all industries is a tremendous undertaking. Consequently, to implement the legislation for two years until April 18, 1973, the Secretary of Labor could adopt existing national consensus safety and health standards and established federal standards by publishing in the Federal Register without going through hearings and review procedures. American National Standards Institute (ANSI) and National Fire Protection Association are examples of recognized national consensus standard-writing organizations.

1. Presented at the annual conference of The International Society of Arboriculture in St. Louis, Missouri in August 1976.