Touching Trees

with Dr. Alex Shigo

By Robert Rouse

Arborists Frances Reidy, Chris Roddick, and Ralph Padilla (l-r) get a first-hand look at included bark, on the inside.

Don't Forget ...

I recently received a copy of an article in TCI which chronicled the relocation of five oak trees from the Hot Springs, Arkansas Convention Center site.

Relocating the trees was a thrilling experience for me. Having seen 126-year-old oak trees that had been relocated in Biloxi, Mississippi, I had no doubts the Save The Tree Committee would succeed in saving our trees.

I did notice that an important group was omitted from the list of those who assisted in the removal and relocation of the trees. The Arkansas Forestry Commission provided a $10,000 grant which enabled the hiring of a professional arborist and tree engineering consultant and the funding of a public educational program about tree removal and, in the process, how to avoid situations where old, valuable trees are lost.

Arkansas Forestry Commission personnel assisted in site evaluation, tree removal, tree relocation and continue to advise on the care of the trees at Transportation Plaza—their new home. A rain forest irrigation system donated by local businesses has been installed.

Julie Dickson
Program Director
Hot Springs/Garland County
Beautification Commission

Putting TCI to Use

Congratulations on producing another superior issue of *TCI*. The September issue was especially interesting to me, especially Bob Rouse's "Planning to Save Trees Before and During Construction" and Sunita Khosla's "When Turf Meets Trees."

At present, I am a consultant to the Illinois Department of Military Affairs, and just completed working on the first year of a three-year tree inspection project.

Most of the Illinois National Guard Armory grounds are treeless. Those that do support (barely) an urban forest are aptly described in Khosla's article: Turf is king! Several Armories are being rebuilt or relocated, so Rouse's observations shall be of use as I advise the construction engineers.

John W. Andresen
Emeritus Professor of Urban Forestry
University of Illinois
Lieutenant Colonel, U.S.A.F. (Retired)

Uncorrected Visions By Neal Desch & Jeff White

One of the problems with growing a giant sequoia indoors.

TCI

The time: early one Saturday morning in September. The place: Paul Smith's, a tiny hamlet nestled in the wilds of the Adirondack Mountains of upstate New York. The purpose: an autopsy. An autopsy! Has there been a crime? Perhaps. Has a death occurred under mysterious circumstances? Maybe. But not to worry, this is not your typical autopsy, or typical crime for that matter. Although our doctor *is* a world-famous forensic pathologist, his discipline is not human pathology, it's *plant* pathology. His field of special expertise is not human anatomy, it's *tree* anatomy. Of course, that works out just fine since our victim is a tree!

At Paul Smith's College, the College of the Adirondacks, Dr. Alex Shigo presented a workshop on hazard trees and the decay process. True to Shigo's teachings, all the attendees of the workshop were encouraged to touch trees. Shigo has a very strong opinion about the importance of touching trees. Expressing this opinion, he passionately pleads, "I would like to see a general *Shigo Rule:* By law, anyone who has not touched the inside of a tree should not be allowed to give an expert opinion about a tree's health."

After being given some lessons in basic tree anatomy and chemistry, we were ready for our first autopsy! Shigo carefully directed the college's staff on how and where to make the cuts. Axial cuts were made every few inches and the pieces were laid out and numbered. This created a progression of tree cross-sections that gave the attendees an easy view of how cracks, wounds and tree defense barriers changed at different locations on the trunk. This is the type of cut arborists make every day, but how often—due to our busy schedules—do we forget to look at the inside of the tree and the story it can tell.

"By counting rings," Shigo shows the class that, "the basic wounding period of the tree was when it was five years old." He hypothesizes that this may have been the time of transplanting. Based on a sudden size change in annual growth rings and the presence of compartmentalization walls to stop internal decay, he goes further, stating his belief that a decay fungus gained entrance through the roots cut during the transplanting process.

After reconstructing the life history of the tree, the attention of the attendees is turned to the apparent relationship of cracks to decayed wood. Shigo explains, "Where the tree was wounded, often you will see, off to the sides, cracks. As the tree moves, it sways, and you get cracks."

"This is a mechanical fracture, starting from the inside. The only way the tree can deal with this is that it sends out some friendly fungi and bacteria to occupy the crack and add some chemicals to slow down the decay process. Some people are interpreting these cracks as coming second. They are saying that the fungus goes out and the crack follows. No! It's the other way around, It's a mechanical thing, and then the fungi follow the crack."

Shigo quickly turns the attention of

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the students to the patient, and he stresses, the evidence that proves his point, "Here we had a second wound and now you see a crack starting over here."

Tree vitality

Our patient had some structural problems before it was cut down. In the past there were some wounds or stresses, allowing decay organisms a foothold. Some cracks followed, but was the tree healthy overall? If it did not threaten to crush a target, could it have survived for a reasonable amount of time despite its structural defects? Was it really necessary to remove it? Our next move was to try answering the troubling questions most arborists ask. We had to check the vitality of the patient.

One method arborists can use to determine the vitality of a standing tree is IKI staining. On our freshly cut autopsy tree, the IKI or iodine staining could be performed so all the eager attendees could easily view the process. On a standing tree, a small core sample combined with a basic understanding of chemistry and tree anatomy is all that is needed.

Shigo asserts, "You can, from select trees, take a small core and determine the vitality of the tree." Shigo explains this is so because, "You will only have stored starch in living cells."

As he stains a portion of the wood with iodine, he explains to the students how IKI stains black for pure starch. As the starch level falls, the stain color progresses from black to purple, violet, yellow, and finally—when no starch is present, there will be no stain at all.

Shigo directs the attendee's attention back to the example and points out that, "in a sense, the purple sneaks down into the (deeper) tissue, then you see a yellow zone, then you see nothing. From here where you see the yellow all the way out (to the bark), that is called the symplast. The symplast is a three-dimensional connection of the protoplasm in a tree. This test will tell you where it is, how much is in it, and where it seeps down in." The depth of the symplast, indicated by starch storage, is what determines the vitality of a tree.

Shigo recommends establishing *seasonal base lines* for the ten most common trees in your area. You can compile these baselines by performing staining tests on healthy trees slated for removal or when removing a limb. Record the results by season. Baselines for each season are necessary because the trees store varying amounts of starch at different times of the year. These baselines will give you guidelines to help judge if the suspect tree is healthy.

As always, Shigo seizes the opportunity to further his student's knowledge of tree anatomy by pointing out that, "You will also see, if you look very carefully, that the cambial zone does *not* stain purple."

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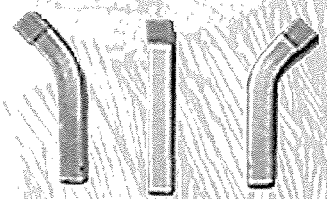

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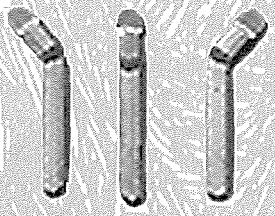

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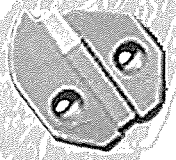

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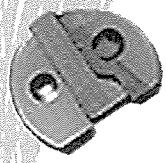

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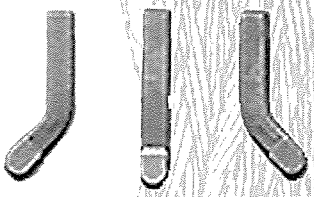

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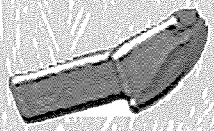

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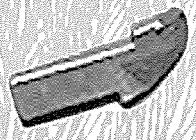

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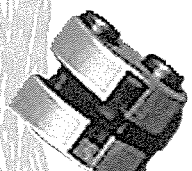

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He notes that the cambial zone does not store starch, therefore no purple staining.

Using an example all people understand, he continues, "It's just as the queen bee does not go out looking for food, you bring it to her. The queen bee has one major job—produce eggs."

Connecting the example back to the cambial zone, he asserts, "The cambial zone has one major job—produce fusiform and ray initial cells."

Decay organisms

But how does a tree's physiological state help prevent or delay decay organisms? Shigo explains that an important factor determining how a tree will react to decay organisms is the amount of moisture contained in a representative sapwood cell, often measured in relation to the fiber-saturation point of the cell.

Decay fungi are primarily aerobes. They require oxygen to live. Many bacteria, however, are anaerobic, which means they do not require oxygen to live. These bacteria may be *friendly* to the tree, providing a degree of protection from decay fungi.

Shigo explains what this means to the tree and the decay organisms. "Bacteria can come in when you have a high amount of water, then you have wetwood. So you either go from case hardening, which is a protection wood on the lean side of fiber-saturation point (having very low moisture), or you can have wetwood, which is a high amount of water on the other side of fiber-saturation point. Believe me, it's tough to be a decay organism because they have very narrow bands and margins where they can operate. This is why I believe in and I worked so hard on the concept of succession."

Many of us are familiar with the concepts of old-field forest succession or forest-fire succession. Succession is the method nature uses to reforest an area that has been cleared for one reason or another. For instance, a farmer abandons a field. Soon small shrubs and trees move in to colonize the field. Years later these *pioneer* species are eventually overgrown by another group of tree species that grow taller or are better adapted for long-term survival. The first group of species, the pioneers, slowly dies off and is succeeded by the second group. Although the number of species involved and number of successions that can take place over time vary by region, the general concept is the same. Another key feature is that the early, pioneer species are providing something that the late succession species need to survive. Perhaps it's just a little shade for the new seedlings, or leaf litter to act as mulch. Perhaps they provide an environment that is conducive to the formation of mycorrhizae that the late succession

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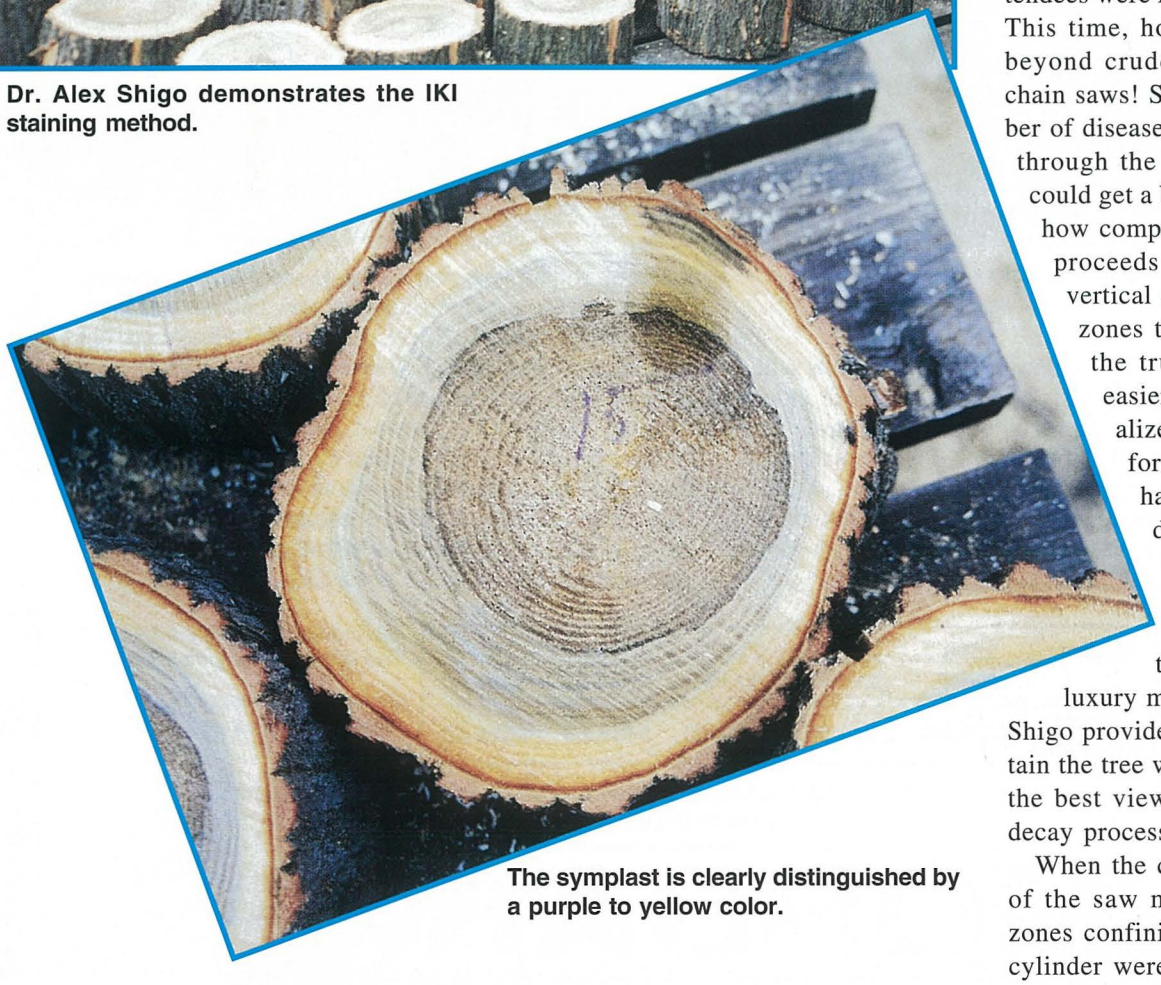
species need to thrive.

This type of succession also occurs when decay organisms are trying to turn your client's tree into dinner.

"One way you could gain entrance and move into a tree is to get a group together," notes Shigo. In general terms, he believes that some species of decay organisms act as *pioneers,* similar to the first tree species that colonize an abandoned field or burnt forest. After wounding occurs, decay organism pioneers colonize the wound, causing the tree to react. The tree fights the decay organisms by secreting a protective shield of chemicals on the exposed area. The first group is killed off, but there is another group waiting! This second group of decay organisms uses the tree's protective chemicals as food. Once these chemicals are removed, a third group of decay organisms will take over, since they can now survive on the wound.

Shigo makes an important point about this process. "The good part about this is that it takes time. The tree forms a boundary. And while the time clock is going by, the tree can put new rings in new positions."

Dr. Alex Shigo demonstrates the IKI staining method.



The symplast is clearly distinguished by a purple to yellow color.

The sawmill

Later that day (after many lessons, discussions and observations), the attendees were ready for another autopsy. This time, however, we would move beyond crude autopsy tools such as chain saws! Shigo arranged for a number of diseased trees to be cut radially, through the center, so the attendees could get a better visual perception of how compartmentalization of decay proceeds over time. This type of vertical cut exposes the boundary zones throughout the column of the trunk. This made it much easier for the attendees to visualize the boundary zones a tree forms over time whenever it has to defend itself against decay organisms. The Forestry Department at Paul Smith's College provided the radial cuts at their student sawmill, a luxury most colleges cannot offer. Shigo provided the expertise to be certain the tree was cut just right, yielding the best view possible of the internal decay process.

When the cut logs were brought out of the saw mill, the tree's boundary zones confining the decay to a central cylinder were apparent. Not only that,

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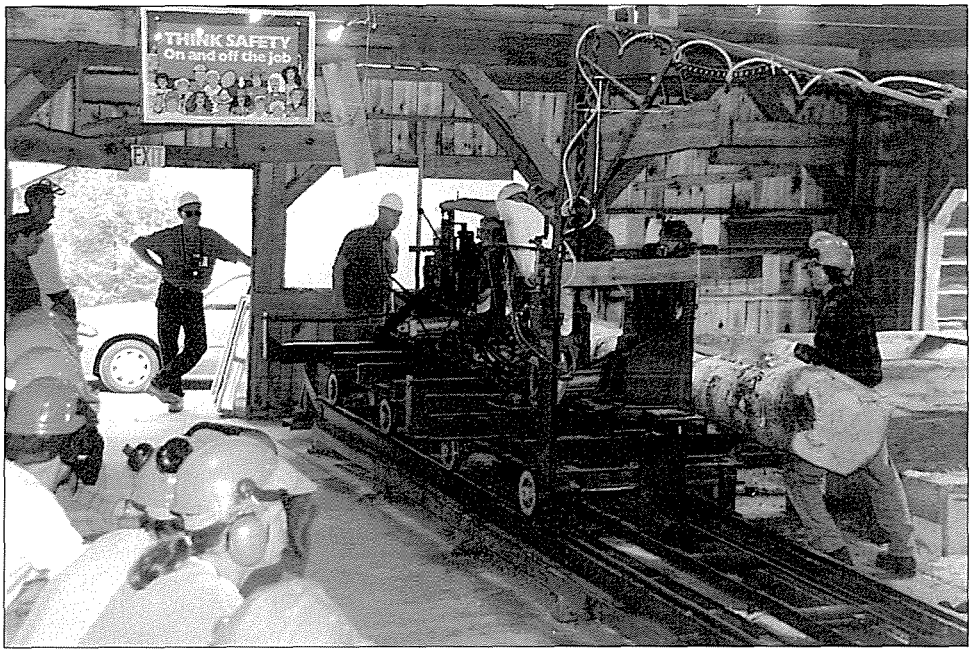
but each successive boundary zone the tree laid down as another injury occurred could easily be seen. Analyzing the life history of this tree, Shigo noted that, "You see, you have major boundaries, over major boundaries, over major boundaries."

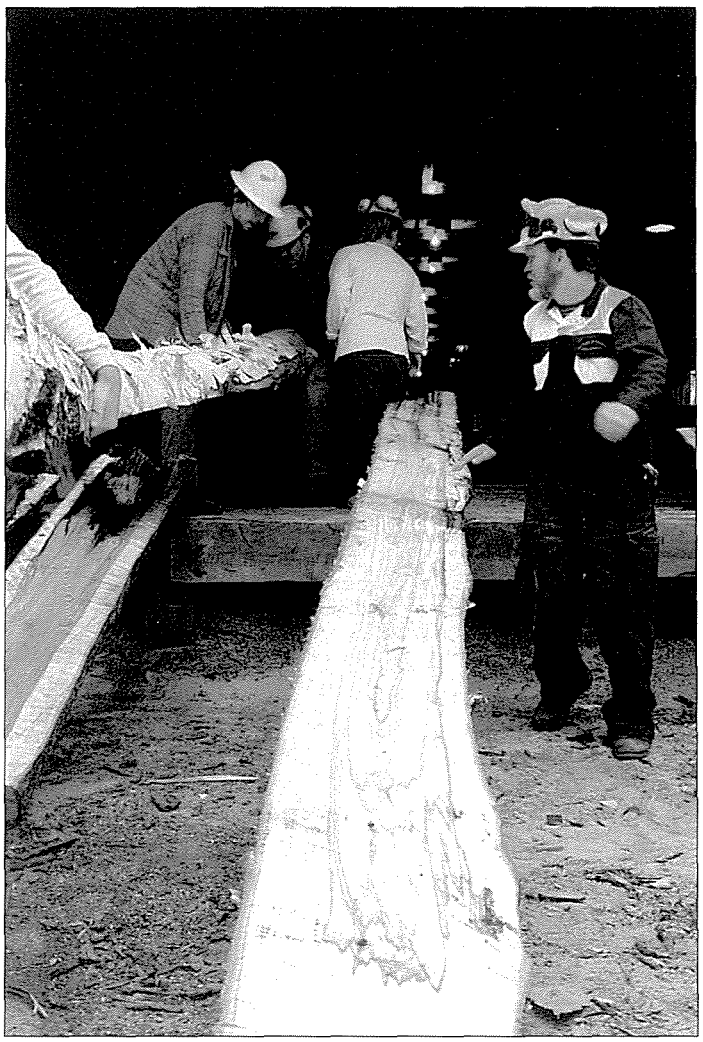
He points to the boundary zone closest to the bark and notes, "The last major wounding period in the life of this tree was right over here."

The sawmill crew cut a number of trees radially to give Shigo plenty of tree defects to discuss. Earlier in the day he had pointed out that many ram's horns, an inward curling of wound wood, are caused by the rapid growth of wound wood. The rapid growth is initiated after a flush cut is made. He had his opportunity to demonstrate the problems ram's horn can create when the sawmill crew cut a tree with a flush cut. The radial cut of the sawmill revealed the boundary zones created by the tree to wall off the decay organisms that attacked the wound.

Shigo was quick to observe, "another reason why we have this break out of a decay organism is we had a ram's horn that not only went vertically, it went horizontally. And the ram's horn cracked the tree out ... in an axial direction."



Shigo directs the dissection of a birch at the Paul Smith's College Sawmill as attendees look on.



'Major boundaries, over major boundaries" are now exposed for all to view.

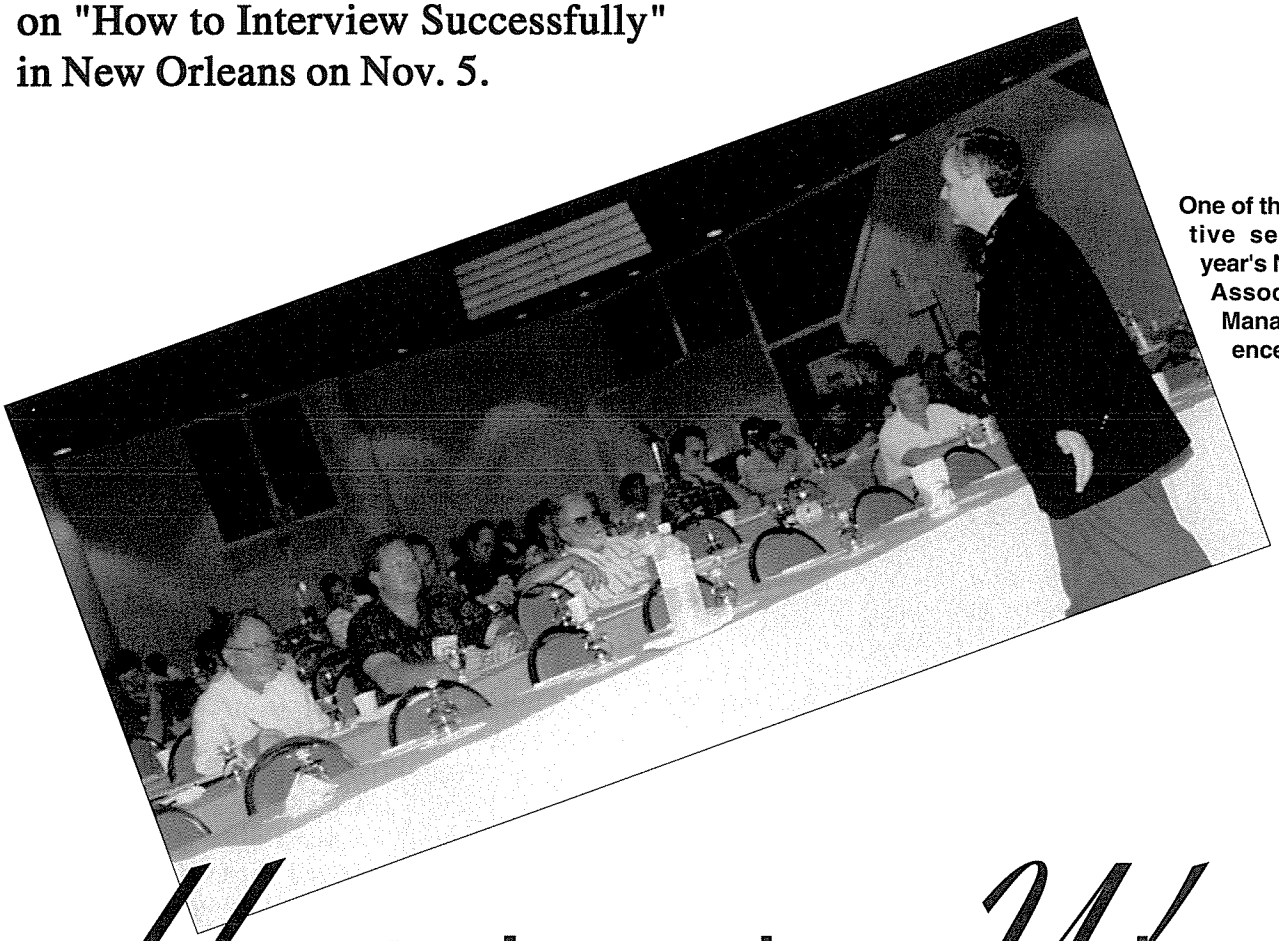
Many other topics were discussed over the course of the weekend. Shigo explained his "simplified" method of hazard tree rating, the use of a Shigometer, identification of hazard trees as they stand, and even related visual signs of tree hazards to the anatomical defects that accompany them on the inside of the tree.

Also, of great benefit of the seminar was being able to take a time out from one's busy schedule to reflect: To think about just what you are doing every time you prune, drill, inject, or core a tree; to think about how the living organism you are treating will respond; and, to think about what is happening on the inside of a tree as a result of the wound, crack or cavity you see on the outside of the tree.

Robert Rouse is staff arborist with the National Arborist Association. TCI

Winter Management Conference Preview!

The author will present an in-depth seminar on "How to Interview Successfully" in New Orleans on Nov. 5.



One of the many informative seminars at last year's National Arborist Association's Winter Management Conference.

How to Interview Winners

By Susan A. Friedmann

Have you ever had an employee accept a position with another tree care company at the busiest time of the year, leaving you high and dry to pick up the pieces and continue "business as usual." It happens all the time. Is this recurring nightmare happening to you?

The success of any organization is its people. Hiring and keeping good employees is a challenge almost all tree care companies face. While there's no foolproof system for selecting people, there are several techniques for identifying "winning" employees who are more likely to stay with your business.

In his "Selecting Winners Workshop," Barry Shamis of Redmond, Wash., outlines the following six-step procedure:

Step One: Developing a profile

Before you can make any kind of hiring decisions, you need to develop a precise profile of the ideal candidate. This profile needs to broken down into two parts—what you expect the person to do and the skills, qualities or characteristics needed to achieve those requirements. For example, as well as having good sales skills, a manager needs to be well-organized, self-directed and have good people skills.

To avoid the "I'll know it when I see it" syndrome, this profile should be written down clearly and concisely. List all the desired expectations, qualities and characteristics of an ideal candidate.

Step Two: Recruiting

This step may be the toughest in the whole selection process. There is a shortage of qualified arborists today and there are even fewer with true expertise in the industry. As a result, innovative approaches are necessary to generate a qualified candidate pool. Today, you need to be both creative and proactive.

Start by determining where the people you want to attract are and what they are doing. Think about searching for candidates where other organizations are not looking. If you want to place an ad, consider specific technical or professional publications.

Even with all that searching, your best source of candidates is still likely to be readily accessible "internal" and "external" resources—employees, customers, suppliers, industry