physiology, genetics, and pathology," he says.

Protoplast fusion, a method for genetically modifying protoplasts, can conceivably produce offspring

Hormone-stimulated buds sprout from a rhododendron twig in culture.



similar to sexually-produced progeny, but in a much shorter time. Fusion begins when an enzyme solution is added to a small piece of plant tissue to dissolve its cell walls. With these barriers removed, protoplasts from the desired "parents" can be mixed together in a chemical solution. There they fuse, creating a "soup" of genetic material and cell organs within a hybrid cell. Under the right culture conditions, the hybrid cell forms a new cell wall, divides, and grows into an irregular cell mass, or callus.

The sought-after result, which occurs with limited success, is to have the cell mass develop into a new plant, genetically different from either parent. McCown says once calli develop, researchers can subject the cell masses to a selection process, exposing them, for example, to a stress such as cold or a toxic substance. Ideally, the survivors of this microscopic "selection of the fittest" will be resistant to that stress agent.

But McCown speculates that "even without a selection process we may end up with genetic variants anyway," since the cell cycle cannot be completely controlled during the culturing process. That loss of genetic stability, which is programmed into the normal reproductive "machine," can lead to new gene arrangements.

A Fusion of Species

Scientists are fusing protoplasts from different plant species and even different genuses in the hope of producing new plant varieties. Cells from unrelated species have been successfully fused, but, to date, only a few hybrid plants have resulted. McCown suspects that the nuclei may not fuse properly, chromosomes may be lost, or "a hundred other things may be going wrong."

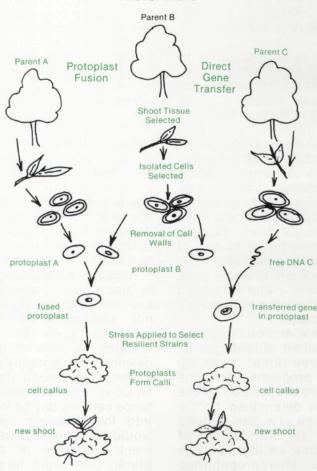
"Plants, and especially woody plants, are governed by such complex reproductive mechanisms that it's going to be difficult to direct the fusion into a predictable end product," he says. "For instance, no one is certain whether intergeneric hybrid cells will truly retain the characteristics of both parents or whether eventually one line will completely overtake the other, resulting in a plant identical to one of the originals."

McCown says that the gene pool in plant cells, even from the same plant tissue, appears to contain so much inherent variability that the smorgasbord of possible outcomes in protoplast research raises more questions for scientists than it answers. He adds that unlocking the mystery is going to make the next decade "an exciting time in plant physiology and genetics."

Editor's Note: Bill Keenan is a Science writer for the University-Industry Research Program at the University of Wisconsin - Madison. The UIR is a program of the Graduate School of the UW-Madison and its mission is to encourage and develop university relationships with business, industry and govern-

Dr. Brent McCown is a member of the Department of Horticulture faculty at the UW-Madison, a position he has held since 1972. Prior to that, he spent two years as a Visiting Professor of Plant Physiology at the Institute of Arctic Biology, University of Alaska in Fairbanks. As a Captain at the U.S. Army Cold Region Research lab in Hanover, New Hampshire he studied possible effects of the Trans-Alaska pipeline on the plant environment and vegetation of Alaska, Dr. McCown has both research and teaching responsibilities at the UW-Madison. In 1977 he received the College of Agricultural and Life Sciences "Outstanding Teaching Award." In 1980 he was awarded the International Plant Propagator's Society "Outstanding Research Paper" Award. He is author and co-author of many research papers and articles in the areas of plant physiology, horticulture and environmental resource management.

CROSS-BREEDING WITH **PROTOPLASTS**



Wisconsin Pathology Report

Maple decline on Wisconsin golf courses

By Dr. Gayle L. Worf Vaughan-Bascom Professor Department of Plant Pathology University of Wisconsin-Madison University of Wisconsin Extension





Even though the sugar maple is Wisconsin's state tree, it doesn't hold forth without problems, at least in the urban environment, including our golf courses. Other maples come in for their share of problems from time to time—even a silver maple. But the sugar maple seems to face more problems, and some of them have not been explainable. That's why the special project on sugar maple decline was initiated in the Department of Plant Pathology several years ago. Funds for the research came primarily from state "consortium" support, but the International Society of Arboriculture made several grants over the past four years, and private citizens and state arborist organizations also made important contributions.

Mike Drilias was the graduate student involved. He's just finishing his work, prior to joining the faculty at the University of Tennessee, after working with Drs. Jim Kunz and Gayle Worf on the project for nearly five years.

Mr. Drilias found some very important aspects about maple trees in the urban environment. This article shares some of those results with you.

Typical symptoms of maple decline include premature autumn coloration, early leaf fall, twig and

branch dieback, and often accompanied by a heavier than normal seed set on the plant parts showing these symptoms. A number of factors can cause such symptoms to develop, including drouth, soil compaction, girdling roots. Somewhat mimicking symptoms may also be associated with nutrient disorders or Verticillium wilt. Salt damage (from road deicing) also occurs along city boulevards. However, none of these could account for most decline symptoms we encounter in such settings as golf course roughs and landscapes. Mr. Drilias' work turned up two pathogenic problems that are damaging to many Wisconsin maples, and one of them is now established as the primary cause for the decline of some of our maples.

The first is an "annual canker" caused by the soilborne fungi Fusarium solani and oxysporum. These organisms are soilborne, but most of these cankers occur on the trunks. Some occur at the root collar. Fusarium cankers generally are elongate or elliptical in shape and never have been found to entirely encircle, or girdle the trees. Drilias found that this fungus is active for only one year, and it rarely attacks vigorous maples. Consequently, we believe Fusarium canker may contribute to, but not cause maple decline.

The second disease has proven to be much more common and important. It is called "collar rot," and is caused by the fungus *Phytophthora citricola*. Collar rot is a progressive, perennial canker. Cankers are initiated at apparently nonwounded root collars located below ground level, or at wounds sometimes made by girdling roots. Collar rot progresses around the root collar, up the trunk, and down buttress roots. Collar rot usually girdles infected trees. Because

collar rot is initiated at root collars located below ground level, careful examination is required to find infected tissues in most instances.

The bark and wood symptoms of collar rot will vary with the time of year. In late summer and in autumn, when P. citricola is active in host tissues, characteristic collar rot symptoms develop. A dark fluid occasionally discharges from apparently healthy bark (as also can happen from annual cankers); this symptom often is the only external evidence of collar rot on otherwise healthy trees and on trees with initial decline symptoms. Recently infected inner bark is discolored, light red-brown and remains tightly attached to the underlying sapwood which also is light red-brown in color. The canker margin is distinct; the inner bark and cambium at the margin are discolored olive-green and this discoloration is most prominent near the cambium, eg, the inner bark area. Inner bark infected during previous years is discolored dark red-brown. As the bark dries, it often cracks and loosens from the underlying sapwood which is similarly discolored.

One of the best diagnostic tools we have for collar rot at this time is a pocket knife, used to tap around the base of a suspect tree. Bark in the condition as we've just described usually is loose, but we can't see it. "Knife tapping" around the base of the tree gives a hollow sound, rather than the firm sound of a healthy tree. The inner symptoms that we've described obviously requires the use of a hatchet, chisels and similar equipment to make the observations, and the symptoms are usually found below ground level. However, they typically move up the trunk over time.

Advanced wood decay often is present at the center of the cankers. Such decay is not a part of the collar rot syndrome, but follows in afterward, or in conjunction with collar rot. This occurs only after trees have first been girdled by collar rot.

Phytophthora collar rot is a perennial canker. That is, it can continue working on the tree in successive years. As a result, it can eventually surround the tree just beneath the bark, and if that happens the tree will die.

Evidence indicates that the

disease is inactive in the maple tree in spring and early summer. Consequently, symptoms are not as characteristic then. Inner bark is uniformly discolored red-brown and lacks the distinct olive-green margin. This bark remains tightly attached to the sapwood until cambial growth of surrounding nonaffected tissues (tissues that will become infected in late summer) causes the bark to crack and loosen.

Phytophthora collar rot occurs on maples with or without crown symptoms. In fact, some maples without crown symptoms were found to have been girdled by collar rot. In some cases, infected trees die within two years after crown symptoms first appear. Some infected trees live longer, but eventually are girdled and die.

What can be done for trees with collar rot?

Drilias tried drenching trees with Subdue, Banol and similar water mold-controlling chemicals without success. This was apparently true for two reasons: first, the fungus was unusually tolerant to Subdue in laboratory tests; second, once the fungus had gained a good "foothold" in the tree, it was not reached by the fungicide. Composted hardwood mulches have suppressive activity against Phytophthora in some situations. It might be useful to open up the area about the base of the tree by carefully removing the soil without damaging the stem and roots. Then leaving the area open to dry out, or possibly adding the hardwood mulch might help, but there was no good way to test these

Can collar rot be prevented?

Collar rot has only been observed on transplanted trees! Woodland trees, or trees coming up from seed in urban settings are apparently unaffected. Much of Drilias' work in the last year was spent in trying to gain an understanding of this interesting point. At first it was thought that the fungus might be hitchhiking in from the nurseries. Or there may be antagonists present in forest floor litter that stops Phytophthora growth. There still might be something to the latter, but Drilias found the organism to be present nearly everywhere he looked in soil samples from both urban and rural woodland sites. So we have to

assume that it's not just the presence or absence of the pathogen that is involved here.

The evidence suggests that transplanted maples ultimately become subject to the disease because we establish a favorable environment for the pathogen. Trees that are planted deeply enough so that the roots do not flare out over the soil surface as they do in the woodlands are good candidates for the disease. Water probably traps periodically at the soil line by the trunk, which is below ground on such transplanted trees, and consequently becomes subject to ultimate infection over time.

So it would appear that we can greatly increase the probability of long time survival of sugar maples by planting them shallow. Mulching these trees with a layer of composted hardwood bark may also help keep the fungus from getting started.

Drilias' work required the excavating of many roots systems. It also involved some comparison of woodland root systems versus urban tree root systems, at least in the proximity of the collar. Many urban tree root systems appear horribly disoriented!! Rather than roots radiating outwardly in an orderly manner, on many trees they grow in "circles" and fail to develop properly. Whether such disorientation is directly damaging to the tree's welfare can only be surmised at this time. However, he encountered many trees-with and without Phytophthora collar rot-where girdling roots had developed. That is, roots of the same tree eventually grew into and around the trunk so as to strangle them. Dis-oriented root systems and girdling roots will have to remain as a subject for another time. but it would certainly appear that the time taken to plant and establish sugar maples so that the roots are not confined too tightly, so that they are not planted too deeply, and they are examined periodically to insure good establishment are requirements for their long time health. One sees many venerable old sugar maples doing well in an urban environment. Could it be that they were planted at a time when time was not the premium it is today, and attention to good planting details was common practice?







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Wisconsin Turfgrass Winter Conference

By Tom Harrison

The Wisconsin Turfgrass Association held its fourth annual Winter Turf Conference/Annual Meeting on January 24, 1985. The event, held at the Arlington Exposition Center, attracted over 160 turf professionals from around the midwest. After registration, rolls and coffee; staff members from the U.W.-Madison Extension presented talks on 1984's field work, research progress, and insight into new and old products. Discussion time was spent on which products worked as well as which did not. Speakers included Dr. Dan Mahr, Dr. Robert Newman, Dr. Gayle Worf, Dr. Wayne Kussow and Roseann Kachadoorian. After lunch Dr. Donald Peterson, Associate Dean of the College of Agriculture and Life Sciences U.W.-Madison, gave a brief welcome and many words of thanks and encouragement to all in attendance. Dean Peterson praised the turf industry for digging in and supporting U.W. researchers when budgets are tight and outside help is essential for programs to continue.

Following Dean Peterson, John Turner representing the Tuco Company came forward to present a \$500 scholarship to Wayne Horman, a U.W. student in Turfgrass Management at the U.W.—Madison. Tuco is setting up an annual \$500 scholarship for a U.W. undergraduate student interested



Lunchtime!



John Turner presenting TUCO scholarship to U.W. student Wayne Horman.



Attendees gathered for annual meeting.

in turf as a profession. The scholarship award presentation is to be a regular part of the WTA winter turf conference. The afternoon session was divided between the WTA annual meeting and time to informally discuss turf problems with U.W. researchers. The annual meeting was very brief with little discussion from the membership followed by the election of three new board members. Board members elected for three year



New WTA banner, compliments of Ed Devinger.

terms included: Arnie Seig (The Bruce Co.), Monroe Miller (Blackhawk C.C.), and Red Roskopf (Camelot C.C.).

The conference was deemed a success by everyone in attendance. A meeting such as this allows turf professionals to break up a long cold Wisconsin winter and meet with associates to share thoughts on 1984's successes and failures and point to the new year with much optimism.



Dr. Worf and WTA members discussing turf diseases.

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From the Director's Desk THE GOLF TURF INDUSTRY IN WISCONSIN: SOME REFLECTIONS

By Stanley J. Zontek, Director USGA Green Section Mid-Atlantic Region P.O. Box 2105 West Chester, PA 19380



The golf course turfgrass industry in Wisconsin has "come a long way" in a very short period of time. As a regional agronomist for the USGA Green Section, I have been fortunate to observe firsthand just how rapid this change for the better has come. For example, it wasn't all that many years ago that only the wealthiest clubs with the biggest budgets had a fairway fungicide spray program. Now, most every club in the state routinely sprays their fairway turf for disease when conditions warrant. It costs more money, but the turf is better for it.

The condition of the putting green turf is better. Greens are

smoother and truer putting than ever. At one time, putting green survival through the year was always a concern. Now, large scale losses of putting green turf are rare. I believe today's golf course Superintendent knows how to maintain greens better. Closer mowing, more and sandier top-dressing, vigorous aeration and vertical mowing along with the careful application of water, fertilizers and pesticides are expensive but, the turf is better for it.

Boy, has there ever been an improvement in overall fairway turf quality, health and survivability with the advent and acceptance of the use of light weight mowers to cut the fairway turf and even pick-up the clippings. Talk about coming a long way in a short period of time! What was once considered a laughable and even ludicrous idea is increasingly becoming the norm on golf courses in Wisconsin. It costs more money but, the turf is better for it.

It wasn't all that long ago when our industry was losing some of our important chemical tools. Now, this trend is reversing. Instead of agonizing over these restrictions, new chemicals which are helping us do our jobs even better are coming onto the market in ever increasing numbers. This trend looks like it will continue. Also, the chemicals that we now use are better understood and protected by a more concerned and active industry. These materials are expensive but, the turf is better for it.

Professionalism within an industry group is a difficult thing to define. However, enthusiastic attendance at local, regional and national conferences, active participation and support of and in national educational, research and fraternal organizations and groups are important aspects of a progressive group of professional golf course Superintendents. Your banner is your newsletter, **The Grass Roots**. All of these efforts cost money and take time but, the turfindustry is better for it.

Finally, there is one other reflection and impression I have about the turf industry in Wisconsin. There seems to be a spirit within the state, a type of drive-to-improve. This is healthy. It sometimes may not be easy but within ourselves there should be a

feeling that we are doing our jobs better...and I think you all are. I hope this spirit never dims.

The turf industry and the quality of grass on which the game of golf is being played has improved immensely in a very short span of time. None of these improvements have come easily nor inexpensively. But, there seems to be a willingness for the clubs to support the courses at a higher level and the expected has occurred. The golf course Superintendents have responded and, the turf in the state is better for it.



ATTENTION!

Due to a scheduling oversight, the March meeting of the WGCSA has been changed to Monday, March 25. The time will be 10:30. The place remains the Traveller's Inn in Fond du Lac.

You must mail in a second reservation; it will be in your mail soon. Apologies for any inconvenience.



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THE STORY OF A SHREWD SUPERINTENDENT

Every once in awhile a human interest story crosses this editor's desk that is worthy of copy space because it should be shared among the members of the WGCSA community. This is such a story. Although it is embarrassing and humiliating, it is true and should be spread far and wide.

It is a tale of an unnamed Golf Course Superintendent at a posh. exclusive country club located on the northside of Milwaukee. The story began at the North Central Turf Expo in Chicago this past December. During dinner, Wayne Otto. Joe Luigs (from Indianapolis), Rod Johnson, Jim Latham, Jim Farrell, Stan Zontek and the unnamed Superintendent established a "gentlemen's wager" on the size of the eighteenth green at the previously mentioned northside of Milwaukee Country Club. The unnamed Superintendent at the unnamed country club made a "ridiculous declaration" (Stan Zontek's words) that this green at his club measured 10,000 sq. ft. The following are the best guesses from the group:

Zontek 8,265 sq. ft.
Otto 8,400 sq. ft.
Latham 8,450 sq. ft.
Johnson 8,650 sq. ft.
Luigs (has never 8,800 sq. ft.
visited the unnamed club)
Farrell 9,300 sq. ft.
Unnamed 10,000 sq. ft.

Superintendent

Stan Zontek did some detective work (unnamed Superintendent wouldn't willingly give up any information) and found that the 18th green at the northside club measured 8,100 sq. ft! Zontek was the clear winner and the unnamed Superintendent lost big. The numbers are reliable because they came from the unnamed Superintendent's Assistant, Mike

Van Sistine (Whoops! The cat is sneaking out of the bag!) Stan now understands why so many have trouble playing golf with the unnamed Superintendent - they probably listen to his advice on distance, even on wedge shots, because, after all, who should know a course better than the Golf Course Superintendent? The wager was that the loser was to buy dinner for all involved. Following good reporting practices, this editor called the unnamed Superintendent to confirm the story and ask permission to print it. He refused both. He informed me that there will be no dinners bought by him for anyone. Obviously, he is a bitter person and a sore loser.

In an effort to help solve the mystery of the identity of the unnamed Superintendent, a small clue is in order. His initials are D.O.

Compliment his shrewd judgements next time you see him!!

In Memoriam Mel Mork Passes Away

Melvin K. Mork, 57, Golf Course Superintendent of Cherokee Country Club, died suddenly on Monday, February 11, 1985. Mel, 1546 Comanche Glen in Madison, moved to Madison in 1966 from Buffalo Co., near the town of Alma. He spent over 15 years in Service to Cherokee Country Club.

Mel was active in the Madison area and annually worked on the March of Dimes Charity Snowmobile Ride. He was a member of the Lakeview American Lutheran Church and had served with the U.S. Navy from 1951 to 1955. For years he had taught snowmobile safety courses with the W.I.S.M. Snowmobile Club of Waunakee.

Mel is survived by his wife Grace and four children. He was a good man and will be greatly missed by all who knew him.

1985 Meeting Sites WGCSA

March 18 Traveler's Inn — Fond du Lac

April 29 Kenosha Country Club

May 21 Janesville Country (Tues.) Club

June 10 Kettle Moraine C.C.

July 1 Monroe Country Club

Aug. 12 Lake Arrowhead Golf

Sept. 23 Brynwood Country Club (Milwaukee)

Oct. 15 Nakoma Golf Club (Tues.)

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Frame on Management

THE EMPLOYMENT PROCESS

By Ron Frame

In my introductory column I discussed the individualized nature of the management relationship between the manager and

the managed.

This relationship does not emerge from the simple signing of new-employee tax forms, but is grown and developed over a period of time within a particular setting; the period of time is the span of employment and the setting is the environment of employment. Both are controlled by the manager and represent a process important to productivity. We call it "The Employment Process."

The Employment Process can be seen as a continuum, beginning with the candidate's job application and ending with the employee's final check. The Process may have a life of 30 minutes or 30 years, will exist separately for each employee and has four definable stages: SELECTION, INDUCTION, RETENTION AND TERMINATION. To understand the process as a whole, lets look at its

parts.

SELECTION: This is where candidate search, employee acquisition and commitment occur. In the business of growing plants, reasonable questions leading to selection might include: What is the expected role of the plant? Ground cover, ornamental, playing surface, shade? Can it do what it's expected to do? Within a reasonable time frame? At what cost of support and maintenance? At what purchase cost?

These same kinds of investigative inquiries fit the employee selection effort too, and should, in painful detail, be examined as part of the manager's responsibilities to the goals of the organization. What one does at the time of selection has a great deal of influence over what happens at times of production.

INDUCTION: I garden a bit and worry a lot about plants, soil preparation, fertilizer, trimming foilage back, watering, depth of planting, drainage, other plant proximity and other things that may affect health and productivity of the plant. Such an induction process has many parallels to the induction of employees to the job, to the productive environment.

Both in the garden and on the job, we have harvest in mind... productive results. The manner in which the new employee is prepared and inducted — introduced — to the job has a lot to do with the potential productivity of that expensive, newly acquired asset...and a lot to do with the manager's personal career development.

RETENTION: You have acquired and you must retain an asset (an employee). Whether plant or employee, you want whatever it is you selected to do what it is supposed to do over its expected life; it is a resource for the achievement of goals, thus you expect it to make contributions to those goals. Should you assume that its mere presence is enough (plant 'n' forget it) then you are doomed to disappointment. If you don't maintain it, care for it, nourish and nurture it over its productive life, it will fall short of expectations and become a liability rather than an asset.

This is all very applicable to the retention and development of employees. With plants, one operates at three levels of maintenance; preventative, routine and emergency — just as with mechanical equipment. Guess what? Effective employee retention requires the same approach; one works to avoid problems, satisfies routine maintenance needs and deals with unanticipated, emergent problems.

The point of active retention programs is important; to justify payroll expense, the value of productivity must exceed the cost of utility. Employee maintenance for retention purposes makes dollars and cents sense, as well as personal career sense.

TERMINATION: I am always bothered by the need to terminate a plant whose productivity has irretrievably waned. I could easily get two crops of lettuce and radishes if I didn't like those seed spires so much. My raspberries could produce so much better if I could bring myself to tear out the old canes and let the eager new

growth mature to productivity.

With employees, we often delay termination decisions beyond the point dictated by wisdom and let productivity value sink below a cost break-even point. Termination actions play a very important role in crew productivity and can be positive acts rather than dreaded, negative ones. Managers practice their finest avoidance skills here, to the great benefit of no one and great cost to the organization and personal effectiveness.

These four sub-processes make up The Employment Process. While briefly described here, in the next few columns we will deal with each sub-process in sufficient detail to demonstrate the importance of the employment process to successful and cost effective human resource management.

UW—EX Turf Meetings

The University of Wisconsin Extension has scheduled two turf meetings for this late winter period. The topic of both is "Progress Through Research." They will be held as follows:

March 18 — Columbus Club in Appleton. Registration at 9:00 A.M. Program begins at 9:30 A.M. The fee is \$12.00.

March 19 — Holiday Inn in Eau Claire. Registration, program and cost is the same.

The 1985 program speakers from the UW—Madison are Jim Love, Wayne Kussow, Bob Newman, Dan Mahr and Gayle Worf.

Our best to the "GREENEST THUMBS" in the State... enjoy a bountiful 1985!



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PLANS SET FOR REINDERS TURF & IRRIGATION CONFERENCE, EQUIPMENT SHOW AND SERVICE CLINIC

Reinders Brothers, Inc., host of Wisconsin's largest Turf Conference, has plans finalized for the 1985 show. It will be held March 13th and March 14th at the Waukesha County Expo Center in Waukesha. Speakers representing the University of Wisconsin, the University of Nebraska and Michigan State University will be on hand to update participants on the latest research involving turfgrass. Industry leaders will be speaking, as well. Guest speakers for 1985 are:

Mr. Don Bossart
Twin City Engine
Mr. Doug Colson
Toro Company
Mr. Robert Earley

"Lawn Care Industry"

Mr. Bob Ehart State of Wis.-Dept. of Ag.

Mr. Les Heinemann Kohler Company Mr. Greg Hollahan Toro Company

Mr. Bill Howell 3M Comapny Dr. Dan Mahr University of Wisconsin Ms. Sherry Miskowski American Red Cross

Dr. Robert Newman
University of Wisconsin
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Mr. Bill Speelman Toro Company

Dr. Joe Vargas

Michigan State University

Mr. Desi Williamson Rain Bird Sales

Dr. Gayle Worf University of Wisconsin

Mr. Gary Zwirlein

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Reservations are necessary to attend the Conference. Reinders staff are requesting advance registration to eliminate delays on the day of the Conference and to have an accurate count for lunch. Advance registration will be \$9.00 per person per day, or \$10.00 per person per day at the door.

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