New, High-Tech Greenhouse Dedicated on UW-Madison Campus

By Monroe S. Miller

The University of Wisconsin-Madison Departments of Horticulture and Agronomy dedicated a new campus greenhouse on Friday, April 4. The new D.C. Smith Greenhouse is named for Professor Smith, long time Agronomy faculty member and department chair for 19 years. His son Irwin donated half of the $2.6 million construction costs. The state paid the other half.

The new Smith greenhouse replaces the Babcock Greenhouse Range that was a campus landmark for decades. Facing University Avenue and Babcock Drive, the old houses were torn down to make room for a desperately needed parking ramp. They were plagued with rotting wood and insect infestations and even lacked the electrical service to run high intensity growth lamps during the winter months. Safety had also become a factor. They were simply worn out.

High technology is at every turn in the new building. It is primarily a wood and glass structure and has 11 greenhouse bays. A central computer monitors and records environmental conditions in each, and it also does everything from watering plants to turning down the lights or closing mechanical roof curtains. Also featured are a hot water system to regulate temperatures, fine mesh screens that limit insect spread, and a fogging system that can create a tropical haze in one of the bays.

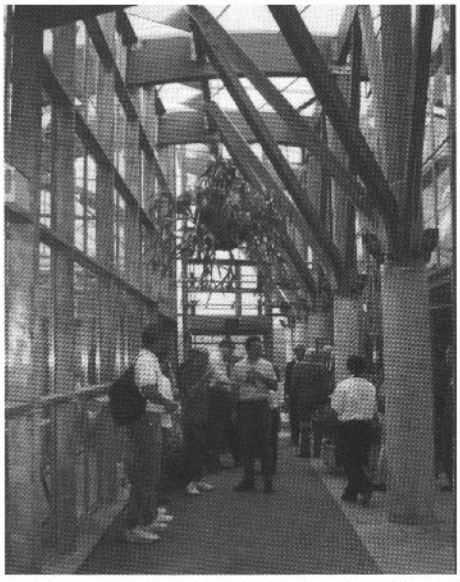
The D.C. Smith Greenhouse is the second of three major campus greenhouse complexes to be replaced. The Walnut Street greenhouse is next in line for renovation; fundraising for that project is underway by the University of Wisconsin Foundation.

The centerpiece to the facility is the 1,600-square-foot conservatory. It is full of ornamental plants and will be a lab for "interiorscaping", a new discipline that designs and manages indoor gardens like those in shopping malls and office buildings. The conservatory, which faces LInden Drive and Babcock Drive, is open to the public.

The dedication ceremonies took place on the lawn across Linden Drive from the greenhouse, near the Microbioloby building. Governor Tommy Thompson, Chancellor David Ward, Dean Roger Wyse, and Irwin Smith took part in the dedication ceremony. The governor spoke of state/industry and state/private partnership in projects like this one. For those like me, the Noer Facility also came to mind.

Next time you are in Madison and near campus, park in the new ramp and take a look at the new greenhouse. You'll envy the undergrads who will be able to get their hands dirty in such beautiful surroundings!

Governor Tommy Thompson took part in the D.C. Smith Greenhouse dedication.



Students, faculty, alums and industry supporters were impressed by the design and technology of the new greenhouse.

A string quartet played classical music in the conservatory during the open house of the new Smith greenhouse.

The hallway that connects all the greenhouse bays.

The conservatory faces Linden Drive. The gentleman crossing the street in the left of the picture is Irwin Smith, son of the greenhouse namesake and donor of $1.3 million to the project.

Thinking About Biological Control

By Gary Gaard, TDDL Staff Member, and
Mary Francis Heimann, O.SF., Plant Pathogen Detection Clinic Staff Member
Department of Plant Pathology, University of Wisconsin - Madison

In the roots of turf there is a constant battle for a niche in which to live. If the "bad guys" (pathogens) win the battle, the result is disease. If the "good guys" (biological control microbes) win the battle, the result is healthy turf. To achieve biological control, a manager can add biocontrol organisms to a crop. Also effective is using those management practices that encourage growth of the "good guys" to the detriment of the "bad guys". We present here a scanning electron microscope (SEM) photograph to help you conceptualize one mechanism of biocontrol.

The fungus pathogen *Gauemannomyces graminis* is the causative organism for the take-all disease of wheat. The same fungus causes take-all patch in cool season amenity turfgrasses. It's interesting that new seedings of both wheat and turf are susceptible to *Gauemannomyces graminis.* The "bad guy" is in the soil, or is carried in on seed or by wind, and causes disease before populations of the "good guys" are established.

For the micrograph on page 132 of Ultrastructure of the Root-Soil Interface the caption reads: "In certain soils where wheat has been grown for a number of years in the presence of *Gauemannomyces* the severity of the disease decreases: this is known as take-all decline. In plants grown in such 'suppressive' soils, many of the Gauemannomyces hyphae become colonized by bacteria". In the text, the authors theorize that bacteria (good guys) kill the fungus (bad guys) by attaching to the fungus cell wall. After attachment, the bacteria destroy an area of the fungus cell wall. A hole forms in the fungus wall. These holes are presumed to be fatal, because with time the fungal hyphae collapse.

To see a review of this book: on the Internet go to WWW.wisc.edu/plantpath/ > APS net > publications > APS press > books > Ultrastructure of the Root-Soil Interface. You should find a book review here. Now, if you go back to the Plant Pathology home page you can access the UW-Madison library system and will find that

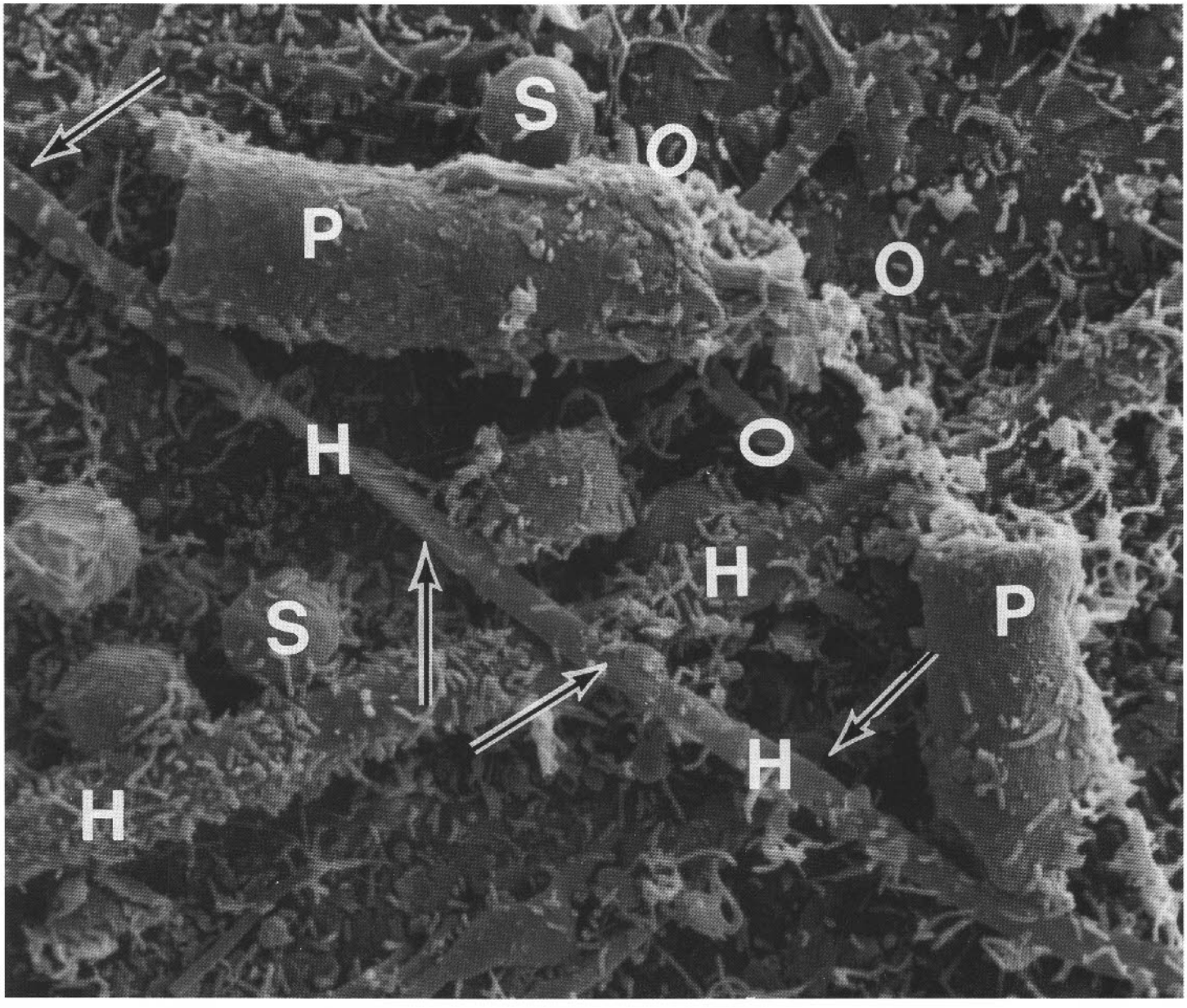
this book (QK644 F67 1983) is available at both Steenbock and the Plant Pathology libraries. Beginning on page 132 there are a series of electron micrographs of *Gauemannomyces graminis* and a bacterium that are almost identical to the electron micrograph we present here.

The photographs here are not of the take-all fungus. They are of the fungus *Thielaviopsis* from poinsettia roots. Perhaps for each fungus plant pathogen there is a biological control bacterium.

Scanning electron microscope photograph of the fungus *Thielaviopsis* grown on artificial media, magnification 3,000X. H indicates thread-like hyphae of the fungus. Spores of this fungus develop in thick-walled pods containing several spores, P. The pod eventually breaks apart to release individual spores, S. Three circles have a single bacteria in the center. There are several hundred bacteria in this photograph. Four arrows indicate holes that bacteria have made in the fungus wall. Note that there are two hyphae labeled—the one with holes is beginning to collapse.

ACKNOWLEDGMENTS:

We wish to thank Heidi Barnhill for assistance with the SEM, S.A. Vicen for preparation of the photograph, and Dr. Maxwell for editorial comments. This project was supported by gift funds to D.P. Maxwell.



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OUR KIND OF GUY

By Monroe S. Miller

The Wisconsin Golf Course Superintendents Association has shown a lot of wisdom over its long history in the awarding of the Distinguished Service Award. From 1930 through our spring business meeting, it has been presented only ten times. The careful and sparing use of the DSA has made it very meaningful and significant. Most often, associations makes similar awards every year, or even twice a year, and the effect is the dilution of its importance. Congratulations to us for exercising wisdom in this matter.

It was clear to everyone who stood to honor and applaud Wayne Kussow when he walked forward to receive the DSA on March 3rd that he understood what was happening to him. For me, it has been awhile since I have seen anyone so emotionally affected by an act of respect, which is what the DSA really is. I was looking through blurry eyes to take the photograph of Wayne and President Kienert, and I cleared my throat several times before I was able to smile and feel the pure joy of the moment.

Wayne had driven to Fond du Lac after his lecture in Soil Science 301 in the morning to give a 15-minute report on WGCSA funded research he is conducting at the Noer Facility. I was chuckling to myself while he was speaking, knowing what was going to occur shortly after.

I also smiled to myself as I watched him speak—the shock of now nearly white hair, neatly combed, the navy blue blazer and red tie and gray slacks he was wearing, and the glasses he now must wear most of the time. It was in stark contrast with how he looks when I usually see him.

The uniform of his work days as a professor and respected faculty member is a pair of Red Wing work boots, blue jeans, and a long sleeve shirt with the sleeves half rolled up. One look and you say, "he's one of us!" It is no wonder we love him so much.

Dr. Kussow has been involved in our business for over ten years now; it doesn't seem possible and begs the question "where has the time gone?" Wisconsin alums, individually and collectively, owe Professor Jim Love much for many reasons. As I reflect back, his most important contribution to us, alums and all others, in the golf course business may be his gentle persuasion that interested Wayne in making a change in his career emphasis. Love's legacy to us may end up being Wayne Kussow.

If you want to know, really know, about a man, ask the people he works with. I did that when I learned Dr. Love was trying to arrange for his position to be assumed by Kussow. One of the toughest faculty members in the Soil Science Department at that time was Professor C.B. Tanner. He was an exceptionally bright man—a member of the National Academy of Science—and respected the world around. He worked constantly and was demanding of grad students and colleagues. I asked him about Kussow, thinking if anyone would give it to me straight, Dr. Tanner would be the one.

And he did. The man was absolutely effusive in his praise of Wayne. He had great respect for his intellect and his talent, telling me "he's one of the best plant physiologists on the campus." Considering the source, that was all I needed to hear. I knew Wayne would be excellent for us.

Over the intervening years, I've seen and learned more about him, all of it good. It has been amazing, at an institution that drives on basic research, to see a full professor so willing and happy to engage undergraduate students. He is a premier advisor who has won the College of Agricultural and Life Sciences Advising Award. Most students at the Madison campus aren't lucky enough to have access to an advisor who is actually a professor—my two oldest daughters will testify to that. Not only does Dr. Kussow have an open door at all times—kids like to chit chat and socialize with him—but he lays before them their program requirements, options and degree needs so they can do serious planning. It is a rare dedication to undergraduates that he has.

Another thing about the turf doc I noticed early on was his work ethic. If I want to speak to him or ask some advice or harass him about his GRASS ROOTS article, I'll call him at 6:00 a.m. or 6:30 a.m. and he will be in his office. Or, on a weekend drive past the Noer Facility, you often will see him working, by himself or maybe with a grad student, in the field, doing outdoor research on everything from runoff studies to root-zone amendments for USGA Green Section specs.

(Continued on page 37)

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(Continued from page 35)

The men who have had him as a major professor in graduate school reveal more about Wayne than most of us would see. What they will tell you about is his keen mind in defining problems, designing experiments that get to the heart of those problems, and analyzing data to see what it all means. It seems his ability to sort through numbers and figure out what they are saying may be one of his greatest strengths. "He is," they'll plainly say, "an excellent scientist." And they all greatly appreciate their time with him.

As I have gotten to know Wayne better over the years and come to call him a good friend, my appreciation for his sense of humor always comes to mind. He is lucky to be able to laugh at the world around him and at himself, and the two of us can tell "farmer jokes" until the cows come home, so to speak. And no one will laugh harder or tell more Polish jokes than this former farm kid from northeast Wisconsin. I think you call this humility—he has generous portions of it—and it is one more thing we like so much about him.

During difficult times in the turf program—faculty retirements, position changes, delays in hiring, new faculty and all that—the glue that held everything together has been Wayne Kussow. Again, we may never really know of the unselfish acts he committed on our behalf; he would never tell anyone about them. One I am aware of that was particularly generous involved his passing on a request for funding his research work so more money would be available for a new faculty member. Nobody does those kinds of things anymore, except for a rare bird like Wayne Kussow. And how about the very day of his award—he delayed the issuance of an already approved grant of $10,000 because he did not need it yet. Honesty—that is what he's about. Rather than spend the money on equipment or computers or travel to a place like the GCSAA conference, he put the good of the group first. It was a perfect example of why we honored him with the DSA.

I am convinced if you cast about, looking for a professor who embodies the very essence of "The Wisconsin Idea" you will choose Wayne. He doesn't hesitate in exercising his belief that the borders of the state are the boundaries of the Madison campus. He's a Wisconsin guy, through and through.

The hot topic of late in the biological sciences has been the successful cloning of a sheep by Scottish scientists. Of course the reaction from everywhere you read anticipates the worst, fearing the consequences of cloning a human. That is a legitimate concern—unless—they clone Wayne Kussow! What could be better?!

For a man who will never blow his own horn, who is perfectly satisfied to labor in our behalf with some anonymity, our Distinguished Service Award was very meaningful. Now he knows how much we think about him. I hope the emotion he felt on March 3, 1997 lasts until he retires.

"Thanks, Doc, for everything. From all of us. You're our kind of guy."

TDDL

WE ARE FAMILY

A look at fungicide families

By Jeffrey S. Gregos, TDDL, Department of Plant Pathology, University of Wisconsin-Madison

The last time I heard We Are Family, I was seven years old and living in the City of Champions (that happens to be the theme song for the Pittsburgh Pirates, and the self proclaimed title of Pittsburgh after the Pirates won the World Series and the Steelers won the Super Bowl for the fourth time). But, back than you didn't have to worry much about disease resistance management. Now that I am 24 and living in a state that prides itself on the Green and Gold, and not the Black and Gold, we are concerned with fungicide resistance.

I have only been in the State for five months, during which time I have met with over 100 superintendents. Several posed the question, "My chemical control program doesn't seem to have the efficacy that it use to have; do you think I might have developed resistance?" Well, I can say one thing: there is a possibility. In order to be totally sure whether or not you have resistance, there are a few laboratory tests that can be conducted to identify a resistance problem.

Fungicide resistance is a serious problem as I had mentioned in my article in the March/April issue of *The Grass Roots*. The effective life of a chemical is dependent on how you use it. If you continue to use it in your spray program time and time again, you have a greater chance of developing resistance than if you alternate or use a reduced-rate mixture.

The systemic fungicides on the market today have only a single site mode of action. If there is a resistant strain of the pathogen in your population, it will continue to dodge the control provided by this chemical. But, if you develop a disease management program that targets several different metabolic sites, you will have a better chance of controlling all the members of the population.

So the best place to start is to understand a little about the way that chemicals of each of the fungicide families work. Most of the time fungicides are either termed as systemic or contact, but this is not precise enough. When I think of a systemic fungicide, I divide it into three distinct groups; localized systemic, acropetal systemic, and systemic. Dr. Houston Couch defines these as the topical modes of action, or the way the chemical interacts with the plant to provide protection from the pathogen. For my discussion, I will term this the "classification of the chemical" (Table 1). With a contact a protective barrier is provided on the surface of the plant. A localized systemic provides the surface barrier plus it is absorbed into the plant and provide protection within the general vicinity of absorption. An acropetal systemic provides the surface barrier along with movement upwards in the plant from the site of absorption. Finally the true systemic has both upward and downward movement within the plant along with the surface barrier.

Biochemical mode of action, or simply mode of action, is the specific site that the chemical interferes with the metabolic processes of the pathogen. In other words, this is how the chemical kills the pathogen. Due to the complexity of these processes, I will only briefly describe the mode of actions (Table 1). This type of information is beyond the scope of this article and is not really required knowledge. What is important is to understand that pathogens have the ability to mutate and to become tolerant to the mode of action of the fungicide. This should be considered when you are developing a fungicide program for your golf course, so you will want to consider using fungicides from different families.

With a closer look at the chemical classification, we will see how this is important in your disease management program. We can tailor our fungicide applications to a particular pathogen. Say for instance that you are battling summer patch; you wouldn't want to be applying a contact fungicide, but instead you would want to apply one of the systemics and water your application in since summer patch is caused by a root infecting pathogen. If you choose an acropetal systemic and water it in, the chemical will be absorbed by the roots and translocated upward in the plant, providing protection of the entire plant.

On the other hand, if you are dealing with a foliar disease you wouldn't want to water it in, unless you are applying preventively and have a couple days for the chemical to translocate upwards in the plant. A better choice may be to apply a contact or a localized systemic. This will provide immediate control. But if you desire longevity of control, an acropetal systemic should be applied.

With the examples provided above, it is evident how important it is to select the correct fungicide. Not only does the application method play a big part, but so does your targeted pathogen. Pathogens are grouped into families just as the chemicals. Every chemical only controls certain pathogen families; this is one of the reasons that you must read the crop protectant label before applying. In Table 1, I have listed some of the diseases that the chemicals control. This is a reference and is not intended to substitute for the fungicide label.

As you can see the fungicide classification, fungicide family, pathogen family, and mode of action of a fungicide all play a major rule in establishing a disease management program. Careful selection of chemicals will provide excellent control of most pathogens that may be invading your turf. Also, with the use of one of the resistance management strategies, you will be assured years of efficacy from any one of the chemicals.

Classification	Family	Family Members	Mode of Action	Diseases Managed
Contact	Aromatic Hydrocarbons	chloroneb, ethazole, PCNB	– affects DNA synthesis – inhibits respiratory enzyme activity	– chloroneb: pythium blight, gray snow mold – ethazole: pythium blight – PCNB: brown patch, dollar spot, snow molds, leaf spots
Acropetal Systemic	Benzimidazoles	benomyl, thiophanate methyl	– inhibits DNA synthesis – inhibits nuclear division	– brown patch, dollar spot, anthracnose, necrotic ring spot, summer patch, pink snow mold, stripe smut, powdery mildew, pink patch/red thread
Contact	Carbamates	thiram, mancozeb, propamocarb	– interference with respiratory activity	– thiram: brown patch, dollar spot, snow mold – mancozeb: brown patch, leaf spots, rust, dollar spot, pink patch/red thread, pink snow mold, pythium blight – propamocarb: pythium blight
Acropetal Systemic	Carboximides	flutolanil	– inhibit respiratory enzymes	– brown patch, pink patch/ red thread, gray snow mold
Acropetal Systemic	Demethylation Inhibitors (DMI)	triadimefon, propiconazole, cyproconazole, fenarimol	– inhibit sterol synthesis	– dollar spot, powdery mildew, pink patch/red thread, brown patch, anthracnose, stripe smut, summer patch, gray snow mold, pink snow mold, take-all-patch, rust
Localized Systemic	Dicarboximides	iprodione, vinclozolin	– inhibit respiratory enzymes	– iprodione: dollar spot, brown patch, leaf spots, necrotic ring spot, gray snow mold, pink snow mold, pink patch/red thread – vinclozolin: dollar spot, leaf spots, pink patch/red thread, pink snow mold
Contact	Nitriles	chlorothalonil	– disrupts cell function regulation – inhibits sulfur-dependent enzymes	– dollar spot, leaf spots, brown patch, pink patch/red thread, anthracnose, gray snow mold, pink snow mold
Acropetal Systemic	Phenylamides	metalaxyl	– inhibits RNA synthesis	– pythium blight, yellow tuft (downy mildew)
Systemic	Phosphates	fosetyl Al	– involves direct and indirect mechanisms	– pythium blight, yellow tuft (downy mildew)
Acropetal Systemic	Strobilurins	azoxystrobin	– interference with respiratory activity	– anthracnose, brown patch, gray snow mold, pink snow mold, leaf spots, necrotic ring spot, pythium blight, pink patch/red thread, summer patch, take-all-patch
Contact	Triazines	anilazine	– reacts with amino groups	– brown patch, leaf spots, dollar spot, pink patch/red thread

For Golf Course Bookworms, *The Rules of the Green* Makes the Rules of Golf More Interesting

By Monroe S. Miller

Gene Haas will probably cringe when (or if) he reads this, but I am willing to confess that I have never found the rules of golf very interesting. It should embarrass me to admit that since one of golf's greatest strengths as a game is the set of rules that govern it the world over.

And although I get lots of agreement from colleagues about a lack of interest in the rules of golf, we all know that good knowledge about them is critical to a well prepared golf course. Great turf is one thing; a well marked, correctly defined and detailed course is also a key ingredient.

Given that, it might seem surprising that one of the better books I have read lately is about...the rules of golf! The book—*The Rules of the Green*—was written by Ken Chapman. He is a professor and a linguist who happens to have a deep love of golf. The result of his background has produced a book that is scholarly and intellectual, interesting and humorous. It is also useful and practical for golf course superintendents.

Chapman made the book interesting by focusing on the history of the rules. He makes their evolution a story on how and why changes over the years have occurred. Now instead of reading a boring recitation of details, you have a story that unfolds as the pages (and years) go by.

The Rules of the Green, which was developed in cooperation with both the USGA and the Royal and Ancient Golf Club of St. Andrews, is also a very attractive book. High quality paper, scores of exceptional and historic photographs, margin notes, highlighted quotes and interesting graphics give it a presence (for lack of a better word in my vocabulary) you will not see very often. It is a beauty.

Most of us have seen, and probably own (or should), a rule book done by Frank Hannigan and Tom Watson. Who better than these two could explain and illustrate the rules of golf? It is a good book and a valuable resource, but it is nowhere near the class of *The Rules of the Green.*

One of my most favorite old golf books is, in fact, a rule book. It was edited by Francis Quimet, who is one of the best known amateur golf players of all time. It is a 1948 book, contains less than 100 pages, and amplifies specific rules with drawings. Although I do love it, it also misses the league of *The Rules of the Green.*

Ken Chapman's book isn't an inexpensive one—$34.95—but it is worth it. It deserves a spot in your golf course reading room.