"Sweet Alyssum" *(Lobularia maritima)* is a popular edging plant. Pink and lavender cultivars are available, but the white ones are still the best. This fragrant little plant is a member of the mustard family, and like most of its relatives, it performs best in cool weather. That means it flowers heavily in spring and fall, but less during a hot summer. Here in Maine, especially along the coast, it flowers relentlessly from late May through mid-October. In hot summers of the upper Midwest, it generally stops flowering in summer, or at least it slows down. In such locations it can be sheared back to 2-3" in height in midsummer, after the first flush of flowering is past, to encourage production of a second crop of flowers in fall. Sweet alyssum is an important source of nectar in early spring and late fall, when many other plants produce few flowers.

"Flowering Tobacco" *(Nicotiana alata)* has been much improved by plant breeders. Years ago, it was a leggy plant that needed deadheading to perform well throughout the summer. Newer types flower much more freely, are more compact (14-18"), and include an expanded color range of reds, pinks, white and pale green. Many are fragrant. Newer types tolerate heat and a fair amount of drought, but all perform better in a slightly more protected spot, and most tolerate partial shade. This plant is frequently visited by butterflies and hummingbirds. If only birds would eat the Colorado potato beetles that bother this plant!

"Parsley" *(Petroselinum crispum)* is primarily known as a cooking herb, but it also makes an excellent edging plant in an annual garden. It is a biennial, so it doesn't produce flowers until its second year. Of course we grow it as an annual, for its high-quality edible foliage. Swallowtail butterflies' caterpillars feed voraciously on parsley leaves. Since the plants produce abundant foliage, this feeding rarely causes significant cosmetic damage to the plant. As a crisp edging for a garden, parsley is a solid performer.

"Petunia" *(Petunia x hybrida)* is a plant that people either love or hate. It requires fairly high levels of fertilizer, it must be deadheaded frequently, and it usually needs to be cut back once or twice during the season to prevent leggy growth. But when managed well, petunia produces unequaled color in the garden. It has one of the widest color ranges of all annuals: reds, white, blues, purples, pinks, yellow and many bicolors. If you are choosing among the standard petunias, select a multiflora type over a grandiflora. Multifloras produce smaller flowers, but there are more of them and they recover better after rain. There are two new types of petunia on the market that are well worth a try. One type is the "milliflora," represented by 'Fantasy Pink Morn,' a 1996 AAS winner. This petunia has even smaller flowers than the multiflora types, and even more of them. It forms a neat mound about 18" across and 10" tall, and requires less deadheading than most petunias. And you would have to have been absent from the planet last year to have missed the "new" petunias that everyone is raving about: depending on the specific group, you may know them by various names like Surfinia, Wonder Falls, Supertunia or Cascadia. These are all propagated from cuttings, but there is one very similar type called 'Purple Wave,' a 1995 AAS winner, that is propagated by seed. All of these "new petunias" have a very low growth habit (3 - 5"), and very strong lateral branching habits, with plants reaching 3 - 4' diameter by the end of the season. And perhaps the best part of all is that they flower freely, remaining in full color all summer without deadheading. (No, I am not joking.) These plants are generally available in 4" pots rather than in packs, and some greenhouse growers only grow them in hanging baskets. All of the "new petunias" require full sun, well-drained soil, regular water supply and fairly high fertilizer rates. But they produce excellent color in return for this small investment. And like other petunias, they attract a wide range of insects, including bumblebees and several species of butterflies.

"Blue Salvia" *(Salvia farinacea)* is a popular plant for the midground and background of annual gardens. it does well in hot, fairly dry locations, and also lasts long after the light frosts of early fall. One excellent cultivar is 'Victoria,' which reaches 18" in height and flowers quite freely. A newer type that is a bit more unusual is 'Strata,' an AAS winner for 1996. This cultivar produces silver calyx tubes and blue petals, giving it a pale blue appearance from a distance, and a bicolor appearance at closer viewing. It is 16" tall, very uniform and quite floriferous. All of the salvias attract many butterflies, but the blue salvias require less maintenance than the others.

"French Marigold" *(Tagetes patula)* is an old standby for annual flower gardens, and new types are introduced each year. Generally, the plants are 8 - 12" tall, with single or double flowers available in yellows, golds oranges and red. Although deadheading throughout the summer is essential to keep them in color, the results are worth the work. Few plants can equal the bright spectacle of these annuals.

"Scotch Marigolds" *(Tagetes tenuifolia)* is less well-known than French and African marigolds, but it is unique. It forms a highly branched mound of fine-leaved foliage, 16" across and 12" high. The single flowers are small (less than one inch diameter) and either yellow, gold or orange. What this plant lacks in diversity, it more than makes up for by requiring little maintenance. It is the one marigold that does not require deadheading to produce flowers all season. A soft mound of these plants lining the edge of a garden is

(Continued on page 43)

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(Continued from page 41)
attractive all season. There is one caution, however; the plants are not as uniform as the other marigolds, and you must select uniform seedlings at planting time in order to achieve a high-quality planting.

The verbenas have long been popular landscape annuals, known for their intense colors. A rather new one, *Verbena speciosa* 'Imagination,' won an AAS award in 1993. A very similar cultivar, 'Tapien Blue,' is a member of the Proven Winners series of annuals. Both are valued for their very fine-textured foliage, low spreading habit (spreading to 24" diameter by midsummer, with a height of 6"), and their intense purple flowers. Both are interesting annuals for some locations, and they attract good numbers of butterflies and other insects, but there are two cautions. First, they tend to produce an intense and prolific array of flowers that peak in color in mid-August, and then diminish in color for the rest of the season. And second, they are difficult to pull out at the end of the season; every stem seems to root vigorously.

Zinnias are beautiful annuals, but powdery mildew and fungal leaf spots can devastate the plants in a humid season. Fortunately, one species of zinnia, the "Narrow-leaved Zinnia" *(Zinnia angustifolia),* is highly resistant to the fungal problems. It produces 1.5" yellow or white flowers all season, regardless of deadheading. The plants are upright and bushy, 18 -24" tall, and very free-flowering. Like most members of the daisy family, the narrow-leaved zinnia attracts many insects including butterflies.

Putting Annuals Together in a Butterfly Garden

Generally, annual gardens look best when many plants each of just a few different types are used. For example, a garden with 12 cosmos in the middle, 30 flowering tobacco plants around them and an edging of sweet alyssum would be more effective than a garden composed of 5 each of 20 different types of annuals. In other words: keep it simple!

Here are just a few ideas for annual gardens, using the plants in the list above:

1. You could achieve a large, rather tall and imposing garden by planting several deep blue or violet buddleias in the middle, surrounded by pale pink globe amaranths, and edged with parsley. In this garden, gomphrena would flower most of the season to attract a constant supply of various butterflies. Parsley would provide caterpillar food all season, and the buddleia would produce great color and attract many species of butterflies from mid-August until hard frost. As the buddleias grew, they would provide cover for birds.

2. A simple but very effective "cool color" garden could be created with a central area of 'Strata' blue salvia, surrounded by 'Lady' lavenders, with an edging of white sweet alyssum. The sweet alyssum would produce color and fragrance for golfers, and nectar for butterflies in the cooler parts of the year. The blue salvia would be effective from late June until hard frost, and the lavender would provide elegance and fragrance in August.

3. You could create a brightly colored garden that would attract a wide range of butterflies with a central area of 'Silky Gold' bloodflower interplanted with 'Red Plume' blanketflowers. Around that, plant lower growing yellow Scotch marigolds. And as an edging, try some dwarf red French marigolds.

4. On a south-facing slope, try a mass planting of one of the low-growing verbenas or one of the "new petunias." Either type of planting would be quite stunning and would require little maintenance during the summer.

IN RETROSPECT — AND LOOKING TO THE FUTURE

By Dr. Wayne R. Kussow
Department of Soil Science
University of Wisconsin-Madison

My normal goal for THE GRASS ROOTS articles is to provide information that may be of use to someone. As 1996 draws to a close, there are a lot of things on my mind. I want to share these thoughts with you, perhaps provide some information that you need to think about, and indicate where I feel we need to be heading in 1997. I'll try not to ramble, but will probably do so anyway.

The College of Agricultural and Life Sciences continues to struggle financially. With over 95% of the budget tied up in salaries, the only means for overcoming deficits is through personnel reductions. Projections are that between 1995 and 2000, the college will have to eliminate 25 faculty and 37 staff positions. A significant number of these cuts have already been made. What this means is that faculty are not being replaced in "low priority" areas and the faculty positions that remain have to make do with a reduced support staff. Not only does this mean a loss in faculty productivity, but faculty having to perform functions normally handled by support staff. Never did I dream some 25 years ago that I'd be spending hours at the computer and the Xerox machine reproducing class exams, handouts, etc.—not very good use of my time as I see it. What bothers me even more is that this leaves less time to stay current with the technical literature and abreast of what is happening in the turf world. This reduces my value to the industry.

I'm pleased to report that by the time you receive this copy of THE GRASS ROOTS, the Horticulture Department should be on the verge of scheduling interviews with prospective replacements for Frank Rossi. I'm also optimistic that by the end of 1997, approval will have been granted to begin the search for a turf and ornamental plant pathologist. Whether or not we will ever see someone assigned to devote some attention to turfgrass entomology is doubtful. At the moment, the "official" allocation of faculty time to turf instruction, research and extension is 0.1 full-time equivalent (FTE) in instruction, 0.5 FTE in research and 0 FTE in extension. Actually, the 0.5 FTE in research is fictitious—probably about half this time this past year has gone into "public service" to try to compensate somewhat for the lack of faculty extension time. Bringing on board Frank's replacement and a plant pathologist will, by my estimates, give us 0.5 FTE in instruction, about 0.7 FTE in research and about the same in extension. Until this happens, we're simply not in a position to respond as we would like to well-intentioned criticisms of the Summer Field Day and continue all of the outreach activities that have traditionally been undertaken by the turf group.

In this era of downsizing and vanishing resources, communication and cooperation become increasingly important tools for sustaining program momentum, putting forth new initiatives and getting the most out of what we have. Cooperation cannot take place without communication and this is where I sense a serious void has developed over the past couple of years. The O.J. Noer Turfgrass Research and Education Facility is a tremendous asset to the college, the state and the green industry. Its full potential is far from being realized. Faculty vacancies are but a partial reason. Of equal importance is the lack of sharing and meshing of resources and their focussed application. At this very moment, I do not know what resources the WTA and its member groups, the Ag Experiment Stations and colleagues in other departments have in terms of interests and resources that might be applied toward operation of the Noer Facility.

To launch into another subject area, how many of you saw the bashing that Milorganite took in the November issue of the Milwaukee Magazine or that lawn care in general took in the May/June issue of the *On Wisconsin* magazine? As so often happens, both articles were sadly lack-

ing in scientific fact, had as their only objective that of alarming the public, and dwelled on the age-old themes of industry and government collusion and coverup. These are the tools of rabid environmentalists who operate in a knowledge vacuum, carefully selecting only that information that suits their purpose and deliberately leaving out that which refutes their claims. Will this type of journalism ever cease and can it be thwarted? Sadly, and with age, I've come to the conclusion that the answer is "No". What we, as members of a proud and vital industry have to do, is forget the fringe groups and forge a concerted effort to educate the public. This will take time and money and its not clear to me where these will come from.

On a more positive note, at least for me, is the fact that some of our outstanding recent graduates such as Josh LePine and Chris Kerkman are having an interesting influence on our colleagues out East. Inquiries are coming in as to whether or not we have others like them looking for employment. It is plain that what is being sought is the Midwest work ethic, politeness and respect for others, reliability, eagerness to learn, and a willingness to take on increasing management responsibilities. I'm telling you this so that you're aware that competition for our graduates is growing!

Having gotten some concerns out in the open, let me wrap this article up with a wish list for 1997.

1. That Frank Rossi's replacement is on board in time for the 1997 research season.

2. That approval for a hiring of a turf and ornamental plant pathologist comes from Ag Hall.

3. That a team of representatives from the UW turf research group, the WTA and its member organizations, Ag Experiment Stations, the Noer Facility and the University Ridge Golf Course can be assembled to begin the arduous task of developing a 5-year plan for turf research and education. In my view, the group needs to lay out needs or objectives, set priorities and goals, delineate responsibilities, and develop an integrated budget that creatively meshes together the multiple resources of the group.

4. Develop an organizational flow chart that clearly delineates authority, responsibility and communication channels with regard to the programs, financing and operation of the O.J. Noer Turfgrass Research and Education Facility.

5. That within the green industry we adopt a broader view with regard to education. It needs to include elementary and secondary students and the adult public as well as college students and members of the profession.

These are some of my hopes for 1997. May they not be merely dreams.

Best wishes to each and every one of for the holidays and in 1997.

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A Scanning Electron Microscope Peek at Poa annua and a Fungus

By Gary Gaard, TDDL Staff Member
Department of Plant Pathology, University of Wisconsin-Madison

A mission goal of the Turfgrass Disease Diagnostic Lab is to "provide rapid, accurate and specific disease diagnostic information". Rapid, accurate and specific is not attainable with current technology when it comes to diagnosis of the patch diseases caused by ectotrophic root-infecting (ERI) fungi-necrotic ring spot, take-all and summer patch. The microorganisms that incite turfgrass patch diseases are fungi with dark pigmented hyphae (thread-like fungal structures) that can be seen with the light microscope. These hyphae grow externally (ectotrophic) on roots and crowns and occasionally attach to an epidermal cell with a structure (hyphopodia) comparable in attachment and function to the mouth of the fresh water leech. This study is the beginning of our search for better ways to rapidly and accurately diagnose your ERI fungal patch diseases.

The accompanying micrographs are of thirty-two day old *Poa annua,* which may have the disease necrotic ring spot caused by the fungal pathogen *Leptosphaeria korrae.* The pathogen was isolated from TDDL Kentucky bluegrass sample 96-152 from Milwaukee County. *Poa* was infected with the pathogen simply by growing *Poa* from seed in soil that contained the pathogen. The micrograghs are presented here to give those of you that have *Poa* annua and an occasional disease on your golf courses an "understanding creates possibilities" image of host and pathogen.

To be certain that a turfgrass disease is present, in addition to symptoms and environmental conditions, some distinct feature must be identified. The distinguishing feature can be associated with the host, as the distinct "hour glass" tan leaf lesion with reddish-brown borders of dollar spot. Or it can be associated with the pathogen, for example the characteristic spores of pink snow mold. Unfortunately an easily observed distinguishing feature for Wisconsin ERI patch diseases has not been identified. This winter Dr. Maxwell's lab is evaluating molecular methods for identifying the causative pathogens for ERI patch diseases.

With the light microscope, I can look at a grass root that is suspected to be infected with a patch disease and say, "There's the fungus". WRONG!!!!! What may look like the fungal pathogen that causes the disease may be any of several saprophytic fungi. Even though hyphopodia are a size that can be seen with the light microscope, it is generally not possible to distinguish them from other fungal structures such as germinating spores.

This summer the TDDL received samples of the ERI diseases necrotic ring spot and take-all, and it became evident that better diagnostic methods were needed to identify the fungi that cause these diseases. This fall I looked at some specimens of patch diseases in the Scanning Electron Microscope (SEM) to see if this instrument could be used as a diagnostic tool. I wanted to see if I could diagnose a patch disease rapidly and easily by visualizing hyphopodia. *Poa annua* was inoculated with necrotic ring spot fungus and prepared for viewing. Preliminary results are not encouraging, as no identifying morphological characteristic for this pathogen was observed. No distinguishing feature was observed in the host, *Poa annua.* Additionally, root hairs are too close in size to the fungal hyphae and too numerous for positive identification of the pathogen.

Biological specimens for the SEM are killed chemically, dehydrated in a solvent, and then they are dried in an auxiliary instrument to remove all solvents and stabilize the specimen. Finally a thin layer of gold is deposited on the specimen surface with another auxiliary instrument. The advantages of the SEM compared to the light microscope are a three dimensional view of the specimen surface, higher magnifications, and the ability to see particles one thousand times smaller.

Dr. Gayle Worf first described the disease necrotic ring spot. Normally necrotic ring spot is a disease of Kentucky bluegrass, but the pathogen will also infect *Poa annua.* There are many reasons for infecting another host. One of Dr. Worf's reasons was investigation of the possibility of using the necrotic ring spot disease as a biological control of *Poa.* My reason was to produce a disease/host association that would be easier to interpret in the microscope because 1). there should be fewer non-pathogen microorganisms, 2). *Poa* is easier to look at than Kentucky bluegrass because with Kentucky bluegrass crown elongation and rhizomes make interpretation of results more difficult, and 3) I wanted to be sure I was looking at a young, actively growing pathogen.

Kentucky bluegrass (necrotic ring spot) and creeping bentgrass (take-all) were also viewed with the scanning electron microscope. No distinguishing features were observed for these pathogens. However, there are indications that there may be some very distinct host responses. These two perennial grasses are much more complex to look at than *Poa annua.* Crown elongation and root dynamics add a new dimension to interpreting results, and there is most likely a seasonal/soil moisture differential response.

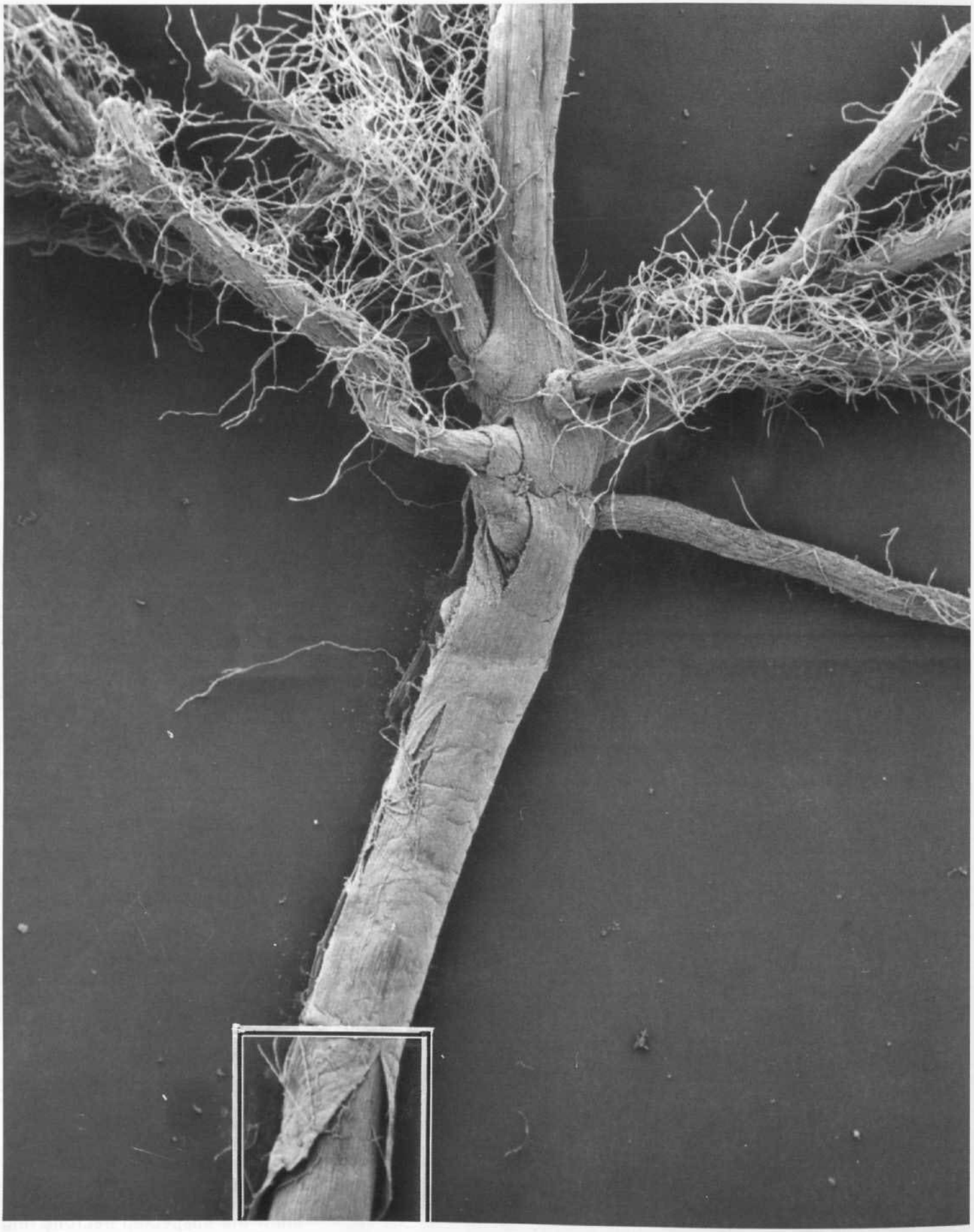
ACKNOWLEDGMENTS:

I wish to thank Heidi Barnhill for assistance with the SEM, S.A. Vicen for preparation of the photographs, Chris Wendorf from L.L. Olds Seed Company for *Poa annua* seed, and Dr. Maxwell and Dr. Worf for editorial comments. This project was supported by gift funds to D.P. Maxwell.

FIGURES:

The scanning electron micrograph on the next page is *Poa annua* magnified 55X. Roots, root hairs and the leaf sheath are obvious. The rectangle is enlarged on page 48.

Poa annua magnified 350X to show the suspected necrotic ring spot fungus. H = hyphae, and arrows point to structures that could be hyphopodia on page 49.



***Poa annua* magnified 55X.**

***Poa annua* magnified 350X**