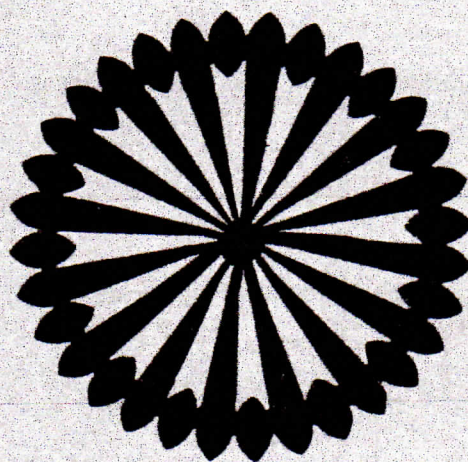


The Pennsylvania State University, College of Agriculture, Department of Plant Pathology

Plant Pathology Newsletter

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Greetings !!

The wonderment of it all! If anyone had asked Linda and me early in 1981 where and for whom we would be working in 1982, the obvious answer would have been Virginia Polytechnic Institute and State University. Little did we realize what was in store for us at that time.

In reality it was an easy decision to accept the new position when offered by this fine faculty and administration. It was easier after we had received the warm and friendly greetings extended by the staff and graduate students during the interview process. But families do not leave a home of 14 years, the friends, the colleagues, the neighbors, the church, or community without emotions being deeply involved. Our greatest find back at Penn State has been the quick renewal of old friendships and the feelings of warmth and kindnesses expressed by so many whom we've met for the first time. Happy Valley has remained as we remembered it from our graduate student days . . . HAPPY.

Obviously, I cannot extol the virtues of this excellent department in the space allowed, but let me place a few things in their proper perspective. Upon arrival on an official first-time basis, I found four huge pairs of shoes under the desk; not two as you may suspect but four!!

The first pair of shoes found under the desk had been worn by a gentleman's gentleman. This individual lifted this department off the ground and it has been floating on waves of success since these beginnings. The initial guidance and leadership provided by Dr. James F. Tammen should be considered paramount to the growth phases of this department but more importantly the feelings of combining hard work with downright fun became the quick path to success. Graduate students, faculty, and staff of those times remain as close as friends and colleagues can become . . . a mark of a true department had been established.

As Dr. Tammen moved on into further successful administration, the leadership of the department was placed into the capable hands of Dr. James R. Bloom who served as "interim head" while the search was conducted for the successor. Under the guidance and direction of Dr. Bloom, the department continued with its initial stature and was not allowed to falter in its course.

The third pair of shoes found under the desk was worn by an individual of outstanding administrative capabilities from many, many aspects and outlooks. The continued growth of excellence and quality within this department is attributable to Dr. Samuel H. Smith and his ability to guide programs of relevance towards satisfaction of long-term needs of the department, college, and beyond. It is likewise important to note that work was continued in expectation of being fun and no better prankster or humorist could have been selected to provide this balance. Excellence in programs and departmental objectives were more deeply settled and established . . . another milestone had been passed. Dean Smith's guidance of the College of Agriculture's programs continues with excellence.

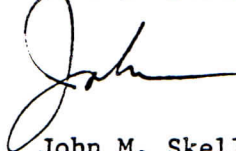
The fourth pair of shoes found under the desk had not been worn long, but obviously had been worn with fervor and dedication. The soles were thin and the heels and toes were scuffed from the battles needed to keep the department moving forward during the next year of "interim" guidance. No such "interim" attitude existed in the expectations of Dr. Paul E. Nelson who served this department well as its Head throughout this critical period. Continuing guidance and decision-making were the rule, expectations of excellence continued for the faculty and students, and excellence in representing this department to the College and University administration was persuasive and never ending. Sacrifices were made to home, family, and personal research interests. Not one piece of paper existed that needed immediate action upon my arrival. Thanks, Paul!

Upon arrival and early in my tenure here as Department Head, my memories go back to walking these halls as a graduate student. Little good will come from reminding other individuals of my student days here at Penn State. There is, however, at least one important exception. Memories of the dedication and spirit of life provided to all of us who had the privilege of working with James Means Ruffaner are among the best. Perhaps no one single individual taught us more about keeping things in perspective . . . being dedicated to working hard while attempting to hold forth with a real sense of humor and love for life as it is. Jim's happy whistle continues to be heard.

So, the department is in an excellent state of health. As stated by myself on interview, the challenge here is to perceive ways to make the Best Department of Plant Pathology...Better. We do have concerns over available space, greenhouse support, renovations, and future positions. These are concerns, not problems of an overwhelming importance. Continued excellence of programs, establishing program priorities, budgeting, combined with maintenance of the feelings of warmth, friendships, and fun, humor and frivolity is the real challenge.

My 'shoes' are brand new. With your continuing support and advice as colleagues, alumni, staff, students, and friends mine, too, will have a chance to become scuffed and battered.

Love Ya Lions!



John M. Skelly, Head

Greetings from Linda, John, Becky, Patty, and David

Buckhout rehabilitation

Buckhout Laboratory is about ready to go through an internal facelift and overall renovation. A recent award of state funds will provide for new heating systems, potential air conditioning, renovated laboratories, and newly conditioned offices. An expansion of the Department into the third and fourth floors of Buckhout (formerly Botany Section space) will permit all faculty, staff and students to be present under one roof by 1984? 1985? ???

Popp Assistantship

The generosity of Dr. HENRY POPP (Department Head of Botany and Plant Pathology, 1950-58) has resulted in a Graduate Student Assistantship to be shared on an alternate-year basis between the Botany Section of the Biology Department and the Department of Plant Pathology. Ms. LORRAINE BERKETT, Ph.D. candidate in Plant Pathology, was awarded the Henry W. Popp Assistantship during an all-day fall faculty meeting held at Toftrees. Dr. Popp attended our luncheon and presented a delightful review of some earlier departmental history. Dr. Popp remains an avid gardener and celebrated a very healthy 90th birthday on November 19, 1982.

Visitors

The first International Oat Research Conference was sponsored by the Center for Cereals Research in June 1982. Several members of the Department, including JIM FRANK, JOHN AYERS, and HERB COLE, are active members of the Center through their research activities on small grains. The conference was attended by approximately 120 scientists representing 11 different countries.

The Department hosted the North-eastern Division of the American Phytopathological Society at its annual meeting November 3-5, 1982. It was the largest meeting in the history of the Division, with an official registration of 346. Local arrangements were made by Dr. LUKEZIC, Mrs. SANDERS and STEVE BROSCIOUS, with Dr. SCHEIN as Chairman. The Sheraton Penn State Inn turned out to be a superb place for the meeting, easily accommodating what could have been an overflow crowd---we expected no more than 250! The graduate students assisted by doing all projection and their superb work made for a flawless performance. Perhaps the most important news is that our group presented 30 of the 142 papers presented. In addition, Dr. AYERS organized a symposium on systems analysis in plant pathology and Drs. P. E. NELSON and TOUSSOUN, LOIS KLOTZ and NANCY FISHER presented a mini Fusarium Workshop. Wish you could all have been here!

Seminar

Department members enjoyed a diverse and busy seminar program this year. Student presentations focused on phytopathological classics during the Winter and Spring of 1982, and this Fall marked the beginning of a seminar exchange series with members of the Plant Disease Research Laboratory, Frederick, Maryland. Dr. Vern Damsteegt, William Bruckart, and ROBERT SHRUM (Ph.D.'69) of the Lab presented seminars at University Park; Drs. PAUL NELSON, STAN PENNYPACKER, and JIM FRANK traveled to Frederick from the Department to present seminars.

Other invited guest speakers included:

- Dr. Yigal Henis, Professor and Head of the Department of Plant Pathology and Microbiology of Hebrew University, Rehovet, Israel;
- Dr. R. N. Trigiano of North Carolina State University;
- Dr. Gordon S. Taylor of the Connecticut Agricultural Experiment Station;
- Dr. Lance Evans of Manhattan College and Brookhaven Laboratory; and
- Dr. ROBERT KOHUT (Ph.D.'75) of Boyce Thompson Institute, Cornell University

This year faculty members were invited to present seminars as part of the regular seminar program, and faculty participants included Drs. LUKEZIC, PELL, TOUSSOUN, HICKEY, and PENNYPACKER.

Finally, Department members were treated to special presentations by Dr. PAUL NELSON on his trip to South Africa, Dr. DON DAVIS on his trips to Finland and the Soviet Union, and by Dr. ROBERT THEBERGE on his six-month stay in China.

Research

New grant

EVA PELL and DON DAVIS are busy looking at effects of ozone, sulfur dioxide and acid rain on crops and trees. A new challenge will be presented to the group in 1983; armed with a contract from the Electric Power Research Institute, they will be developing an open-top chamber network at Rock Springs, designed to measure impact of ozone and sulfur dioxide on quantity and quality of potato.

Adjunct professors

The Department enjoys cooperative working relationships through the appointments of several scientists as adjunct members of the faculty. Our adjunct faculty include: R. S. DICKEY and R. K. HORST--Cornell University; L. W. BURGESS--University of Sydney, Australia; M. R. BONDE, and R. D. SHRUM--USDA Plant Disease Research Lab., Frederick; C. POWELL--Pa. Department of Agriculture, Harrisburg; and K. T. LEATH, R. T. SHERWOOD, Z. E. ZEIDERS, and H. I. SEIF EL-NASR of the USDA Pasture Research Laboratory, University Park. In addition, C. H. KINGSOLVER, retired from the Plant Disease Research Lab., Frederick, remains an active Adjunct Professor.

Dr. R. S. Dickey, Adjunct Professor, is Professor of Plant Pathology at Cornell University and has worked on cooperative projects with P. E. Nelson since 1965. These projects have dealt with bacterial vascular wilt diseases of ornamental plants. More recently Dr. Dickey has been doing preliminary work on the interaction of selected bacteria and Fusarium oxysporum f. sp. chrysanthemi in chrysanthemum. His work is part of cooperative Experiment Station Projects at Cornell and Penn State titled "Interaction of Selected Plant Pathogens in Ornamental Plants." Dr. Dickey also has served on graduate student committees at Penn State and serves as an informal advisor on several of our research and graduate student projects. Dr. Dickey's major research interests are in the areas of bacterial diseases and phytopathogenic bacteria.

Dr. R. K. Horst, Adjunct Professor, works on cooperative projects with personnel in the Fusarium Research Center. He is Professor of Plant Pathology at Cornell University. His major research interests are in the areas of virology and diseases of floriculture crops, especially those caused by Fusarium species. At present he is cooperating in a study of the

interaction of the chrysanthemum stunt viroid and Fusarium oxysporum f. sp. chrysanthemi in florist's chrysanthemum. In addition, Dr. Horst has been involved in cooperative studies on Fusarium wilt of chrysanthemum and the Fusarium stub dieback disease of carnation. He serves on graduate student committees in the Department where his advice and expertise have been and are most helpful.

Dr. L. W. Burgess, Adjunct Associate Professor, has been a cooperator in the Fusarium Research Center since 1970. He is a Senior Lecturer in Plant Pathology at the University of Sydney, Australia. His major research interests are in soil-borne fungi and diseases of cereals. At present, in cooperation with Drs. Toussoun and P. E. Nelson, he is completing a study of the Fusarium species found in soils in pastures in Eastern Australia. This study began in 1976 with a grant from NSF and support from the University of Sydney as part of the United States-Australia Cooperative Science Agreement. The study has consisted of several surveys of pasture areas in Eastern Australia and identification of all Fusarium species recovered. The results will be presented in a monograph in the near future.

Dr. Charles Powell also serves as Adjunct Assistant Professor of Plant Pathology. He is located at the Pennsylvania Department of Agriculture, and conducts a program relating to the tomato ringspot virus, which is economically important to a number of Pennsylvania crops. He is also primarily responsible for enforcing state plant virus certification programs.

Dr. Robert Shrum is an epidemiologist with the USDA-PDRL, and also serves as Adjunct Assistant Professor of Plant Pathology. Bob is interested in evaluating current concepts on epidemic dynamics through sensitivity testing of integrated system models. Aside from the testing done at PDRL, Dr. Shrum is cooperating with Dr. Joe Ritchie, a crop

modeler at the Blacklands Experiment Station in Temple, Texas, to satisfy the mutually agreed upon need to fully integrate crop-growth and disease-increase models. This part of this program is also being supported by a USDA grant for work on southern rust of corn with Dr. Stanley Pennypacker in the Department. Finally, and as a primary goal for the developmental work mentioned above, Dr. Shrum is involved with analyzing data and building models to predict the epidemiologic development of certain exotic pathogens. Currently several organisms are under study at PDRL. The menu of possible choices ranges from organisms representing potential threats to corn, wheat or soybeans, to those of potential benefit in biocontrol of weeds. Dr. Shrum is also a cooperating scientist for a disease loss project on several crops in Egypt.

Dr. Morris Bonde is a Research Plant Pathologist at the USDA, Plant Disease Research Laboratory (PDRL), Frederick, Maryland. He is engaged in research to evaluate the disease potential of exotic (usually foreign) pathogens to major crops in the United States. His present work is on evaluating the potential threat of downy mildew diseases to the American corn and sorghum crops under environmental conditions common in the United States. Because of the nature of his research responsibilities, cooperative projects with other organizations (often foreign) are necessary. Dr. Bonde has cooperative projects with Texas A & M University, the USDA Beltsville Agricultural Research Center, and the Rockefeller Foundation in Thailand. A cooperative project between PDRL and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) to study sorghum downy mildew of sorghum and maize in Africa is being arranged. Dr. Bonde recently returned from a trip to India where he discussed cooperation between various Indian universities or institutes and the USDA Plant Disease Research Laboratory. Dr. Bonde serves as Adjunct Assistant Professor of Plant Pathology in the Department at Penn State.

The U.S. Regional Pasture Research Laboratory of the U.S. Department of Agriculture opened its doors in 1937 at Penn State and was charged with solving problems of forage crops in the Northeastern states. Plant pathology has been an integral part of the research program since the laboratory's inception. At present, the pathologists on the staff include Ken Leath, Handy Seif El-Nasr, Bob Sherwood, and Ken Zeiders, USDA research plant pathologists with adjunct appointments in this department, plus Barbara Pennypacker, a Research Associate. Sue Sim is a graduate student on the clover project, and Bill Priddy and Rick Pedersen provide technical support. Additional input into plant pathology comes from Dave Gustine and Bart Moyer in biochemistry. This constitutes the largest group working in forage crop pathology anywhere in the U.S.

The overall goal of the plant pathology program is to improve the yield, quality, and longevity of forages by reducing the losses caused by disease. Most of the research concerns pathogenic fungi, because the major disease losses of forage legumes and grasses in our region are caused by fungi. Because the selection of plants resistant to disease is the most feasible means of disease control, under the particular cultural situations, the development of such resistance receives major emphasis in our program. Developed resistant germplasm is available to all private and public breeding programs. The selection of disease-resistant alfalfa, red clover, birdsfoot trefoil, smooth brome grass, and orchardgrass is currently being pursued.

In addition to the actual selection of resistant germplasm, development of improved methodology for selection is of interest. Also, basic investigations into host-pathogen interactions, mechanisms of host-plant resistance, pest interactions, disease etiology, disease assessment, and pathogen physiology are pursued.

Plant pathology activities often involve other research disciplines which leads to a very important aspect of the plant pathology program and of the entire research program of the laboratory. A great deal of the research depends upon the cooperation of geneticists, chemists, entomologists, soil scientists, plant physiologists, and animal scientists from our own staff as well as from other federal and state institutions. The plant pathology program is an active contributor in a multi-disciplinary approach to increased production of high quality forage in the Northeastern region.

Extension

"FAST" Evaluation on Tomatoes

"FAST" stands for "forecaster for Alternaria solani on tomatoes." It is a program that uses daily environmental information to forecast the occurrence of early blight of tomatoes, or more precisely indicates when fungicide sprays are needed to control early blight.

FAST is based on two independent models named S and R. Model S uses the daily leaf wetness period and average temperature during that period to determine one severity value (S) from 0 to 4 for the day. Model R uses average daily temperature for the past 7 days, total hours that relative humidity was above 90% for the past 5 days, and total rainfall for the past 7 days to determine a second severity value (R) from 0 to 3. High values of S or R indicate that environmental conditions have been conducive to early blight development. Cumulative values of S for the most recent 7 days (CS7) and of R for the most recent 5 days (CR5) are used to determine whether a fungicide application should be made, and if so whether the interval between sprays should be 5 days or 7 days. When either CS7 or CR5 exceeds a critical threshold value, a 7 day interval is indicated;

when both CS7 and CR5 exceed the threshold values, a 5 day interval is indicated. Model details have been published by Madden, et al. in *Phytopathology* 68:1354-1358.

The FAST program has been evaluated in field experiments for 5 years in Pennsylvania. Each year FAST resulted in effective early blight control and the following reductions in number of fungicide applications: 78% in 1978, 44% in 1979, 50% in 1980 and 1981, and 17% in 1982.

In 1982, a summary of results was presented to growers at a State Vegetable Growers Conference at Hershey, Pa. Two growers wanted to test the program in their commercial fields that summer. We suggested that the growers evaluate the FAST program in part of one field, that they follow a schedule indicated by FAST until first fruit ripening, and that they then switch to a regular schedule for the end of the season. Hygrothermographs and dew meters were borrowed for use by the growers. The original FAST program was written in fortran for use on an IBM mainframe computer. It would have been possible for growers to supply environmental data to the University by phone, to have the program run by a technician at the University, and to get a spray recommendation back by phone. However, this was a cumbersome method and would have increased dependence of farmers on external assistance. Before the beginning of the season, three alternatives were evaluated to determine how growers should run the FAST program. These were: (1) manually by using severity value tables and a special data form with a template, (2) by a TI-59 programmable calculator, and (3) by a TRS-80 pocket computer. The TRS-80 pocket computer was chosen to run the program because it was easiest to use, it was inexpensive, and it reduced the chance of making errors. An educational program was conducted to teach growers how to use the instruments that measured and recorded environmental data, and how to run the FAST program on the pocket computer.

The growers easily learned how to use the instruments and run the FAST program. By harvest time, we could not detect any difference in amount of defoliation in areas treated according to the FAST schedule and in adjacent areas of the same planting that were treated according to a regular schedule. Environmental conditions were very conducive to early blight development in test fields. As a result, FAST did not result in as great a reduction in number of fungicide applications as in previous tests.

Growers were encouraged by results of the tests and want to continue evaluation of the FAST program in 1983. Growers found that the program was easy to run on the pocket computer, and were pleased to be able to run the program themselves rather than having to depend on others. Cooperating growers were frustrated by difficulties experienced in measuring dew periods with the dew meter during rainy periods; during such periods the lead in indelible pencils disintegrated rapidly, the pencils had to be replaced daily, and sometimes it was difficult to read the dew meter following heavy rainfall.

In addition to continuing FAST evaluation for early blight control in commercial fields, work is needed to answer other questions: (1) How can environmental data monitoring be improved? (2) How wide an area can be served adequately by one environmental monitoring station? (3) What other models should be developed and incorporated with FAST to improve tomato disease control?

The area of disease forecasting is exciting. It offers the possibility of improving disease control by improving the timing of fungicide applications. This work was made possible by cooperation of growers, extension representatives, and researchers. It was funded in part by the Pennsylvania Department of Agriculture, Diamond Shamrock Corporation, and Furman Canning Company. We look forward to continuing this promising cooperative effort.

Faculty

Retirements

LESTER P. NICHOLS, Professor of Plant Pathology Extension, retired on April 1, 1982, after 34 years of service to the University. Les specialized in diseases of ornamental plants and was particularly interested in the evaluation of cultivars of flowering crabapple for ornamental and disease resistance qualities. He gained a nationwide reputation for his knowledge in this subject area. A retirement dinner, which was well attended by members of the Department, Extension, and industry, was held for Les at which time he was presented with a number of gifts and mementoes. In November, he and his wife, Fran, moved to Rhode Island, his native state. We will miss the Nichols and wish them the best of life.

On April 1, 1982, Dr. JOHN S. BOYLE also retired from the Department. After C. C. WERNHAM retired from the Department, John became "the Friendly Philosopher" to those who would listen. There are few members of the Department who have not had their ear lobes pulled by John as he said, "Laddie, it's like this." A retirement dinner was held for John in late March. He was presented with numerous gifts, and a number of people reminisced about their associations with John. He and Nellie have done quite a bit of traveling since his retirement but they plan to remain in the area, and John will continue as the "Squire of Tusseyville." We look forward to seeing John and Nellie throughout the coming years.

Dr. RICHARD F. STOFFER, Professor of Plant Pathology at the Biglerville Fruit Research Laboratory, has resigned that position effective December 31, 1982. He has accepted the position of Head of the Department of Plant Pathology at the Georgia Coastal Plain Experiment Station at Tifton. Dr. Stouffer has been at the Fruit Research Laboratory since 1965, and was instrumental in solving the problem of the stem-pitting disease of stone fruit which caused serious losses to the fruit growing industry in Adams County. We wish him much success in his new position.

Travel

Once again this year, members of the faculty and staff crisscrossed the globe as conference participants and invited speakers.

ROBERT THEBERGE, who recently completed requirements for the Ph.D. in Plant Pathology, concluded a six-month stay in China in January, 1982. He was joined in China by DAVE MACKENZIE at the South China Agriculture College to review the Peanut IPM Project underway. Dave and Robert left China and went on to a 10-day visit to ICRISAT in Hyderabad, India to familiarize themselves with the millet pathology program and the peanut improvement project at the center. They were able to visit with BARRY NOLT (Ph.D.'81) and his wife Judy, who are working in Hyderabad. From there, the two took a side trip to Agra and a view of the Taj Mahal. They completed their trip around the world after a final stop in Paris, where they visited with scientists at the University of Paris regarding potato physiology research projects. En route to China, MacKenzie also visited with the Office of Rural Development in South Korea to review collaborative research on IPM programs for rice.

Graduate Students

New Students

European countries were well visited by many faculty: Dr. EVA PELL attended the First International Symposium on Gaseous Air Pollutants and Metabolism in Oxford, England from August 2-5, 1982. Dr. DONALD D. DAVIS presented a paper at an international forestry research conference in northern Finland and took part in a four-day field trip. In October, he visited four cities in the Soviet Union as a member of a 10-man USA delegation and presented a paper in Leningrad regarding the effects of air pollution on forest productivity. DAVID SHRINER (M.S.'69) also took part in the latter trip and presented a paper on the effects of acid rain on forests. JOHN SKELLY attended the International Workshop on Environmental Specimen Banking and Monitoring as Related to Banking at the Lehrstuhl für Biogeographie, Universität des Saarlandes, Saarbrücken, West Germany. A presentation and chairing a discussion session provided incentive for attendance. Fourteen countries were represented to discuss this topic of importance to future generations.

Dr. PAUL E. NELSON represented the Department in South Africa for several weeks in June-July, 1982. Paul traveled to Cape Town to work with Dr. WALTER MARASAS of the National Research Institute for Nutritional Diseases in Tygerberg. Marasas and Nelson made extensive collecting trips throughout the area and to the Transvaal.

South America was not left out this year, either, as Dr. RICHARD R. NELSON traveled to Cali, Colombia in March, 1982. Dr. Nelson visited the International Center for Tropical Agriculture (CIAT) to review programs there.

Eight new graduate students have joined the Department this year. WENDY BAIR is working toward an M.S. with Dr. Ayers after receiving her B.A. in Biology from Gettysburg College. JERRY BARCLAY is pursuing an M.S. in mushroom research under the guidance of Dr. Schisler. Jerry received his B.S. in Soil Science from California Polytechnic University. LESLIE DELSERONE obtained her B.A. in Biology from Seton Hill College, Pa. She is working toward her M.S. in the small grains program with Dr. Frank. RITA FREEBORN hails from Penn State where she received her B.S. in Horticulture. Rita is working toward an M.S. with Dr. Pennypacker. CHOONG HOE KIM graduated with a B.S. and M.S. from Seoul National University, Korea. "Kim's" doctoral research is under the direction of Dr. MacKenzie. KAREN KOONS has returned to Penn State, where she received her B.S. in Horticulture, in order to work toward her M.S. in Virology under the direction of Dr. Romaine. BOB LONG is also a Penn State alumnus, receiving his B.A. in History and M.S. in Forest Resources. His doctoral research in forest pathology is with Dr. Davis. KRISTEN SIGULAS received her B.S. in Agronomy from the University of Illinois. Her M.S. research on disease resistance is under the direction of Dr. R. R. Nelson.

BRUCE GOSSEN joined the Department fall term as part of his Ph.D. program at the University of Saskatchewan. While at Penn State Bruce worked under the guidance of Dr. Pennypacker. LARRY ZANG returned to finish his research on conifer needlecast disease for his M.S. with Dr. Merrill.

Degrees Awarded

This past year several candidates have completed their degrees and have left the Department. Among those receiving Ph.D. degrees were: ALAN BIGGS, who has joined Agriculture Canada, Vineland Fruit Research Station, Vineland, Ontario; SHARON DOUGLAS, who is presently conducting a research program on X-disease of peach at the Connecticut Agricultural Experiment Station, New Haven, Connecticut; and VANN GREGORY, who has joined B & W Quality Growers in Orlando, Florida, as Director of Research and Development. EILEEN KING is developing new testing techniques as Director of Field Pesticide Testing for Ciba-Geigy in Vero Beach, Florida. ELLEN LAWRENCE has a research position at Monsanto in St. Louis, Missouri. ROBERT THEBERGE is with the Agricultural Sciences Division of The Rockefeller Foundation in New York City.

Among those receiving M.S. degrees were: STEVE BROSCIOUS, who is pursuing his Ph.D. at the University of Illinois with Drs. Walker Kirky and S. M. Lin; TED KAUFMAN, who is growing mushrooms for Ralston Purina in London, Tennessee; JUDY PAWLOSKI, who is working in ornamental sales in Philadelphia; and RICHARD LOTSTEIN, who is a research assistant in the laboratory of Dr. Steve Lindau, University of California, Berkeley. RICHARD STEVENSON is continuing as research assistant in Dr. Pennypacker's lab. CHRISTINE STOCKWELL is working in the lab of Dr. James Aist, Department of Plant Pathology, Cornell University. GREG WATSON is pursuing his Ph.D. at the University of Florida, Gainesville, working on sugarcane rust with Dr. Hank Purdy.

Activities

The second annual "Career Workshop" was held in May as a two day event that was also open to students in Agronomy, Entomology, and Horticulture. The workshop, entitled "Industry, Related Practical Work Experience, and the Prospective Employee," included guest speakers representing the federal government, commercial production and the ag-chem industry. Speakers were DR. SAMUEL BRAVERMAN (Ph.D.'57), Assistant Area Director U.S.D.A., DR. RONALD HAMLIN (Ph.D.'71), Senior Research Biologist, DuPont; BETSY SCARBOROUGH (M.S.'74), Vice President, The Conard Pyle Co.

A two-day Field Techniques Workshop designed by the graduate students was held in June at the Rock Springs Research Farm. Instructors included VANN GREGORY and Drs. AYERS, FRANK, COLE and SCHEIN. The agenda consisted of topics in field plot design, influence of cultural practices on disease, disease assessment, sprayer calibration and safety, environmental monitoring and sampling techniques.

Many graduate students attended various meetings (in addition to APS), symposia, and workshops during the year. These activities included: Pennsylvania Vegetable Conference and Trade Show in Hershey; In-Service Education Program for Pennsylvania Extension Agents; various Pennsylvania growers meetings; joint meeting of American Institute of Biological Sciences and American Botanical Society held at PSU this year; Symposium in Molecular Biology and Gene Regulation; International Conference on Air Pollution held in Philadelphia; tour of USDA facilities at Frederick and Beltsville, Maryland; and the American Mycological Society meeting.

The annual departmental socials that were held this year included the Wine and Cheese Party held in Kern Building, the Progressive Dinner, the Summer Picnic in Stormstown, the October Party at the Rock Springs Research Farm, and the Christmas Party with a graduate student skit.

Several graduate students presented papers at society meetings this year. At the APS-Potomac Division meetings held in March at the University of Delaware the following papers were presented:

SAMPLING FOR APPLE POWDERY MILDEW IN EXPERIMENTAL PLOTS. Priscilla J. Parish K. D. Hickey.

DEVELOPMENT OF SEPTORIA CANKER ON HYBRID POPLAR. R. Long, T. W. Bowersox, W. Merrill.

INHERITANCE OF THE PIONNOTAL VARIANTS IN FUSARIUM LATERITIUM. E. B. Lawrence, P. E. Nelson, T. A. Toussoun.

PATHOLOGICAL ANATOMY OF CYTOSPORA CANKER OF HYBRID POPLAR and HISTOCHEMICAL ASPECTS OF CYTOSPORA CANKER OF HYBRID POPLAR. A. R. Biggs, D. D. Davis, W. Merrill.

LOCATION OF PRIMARY INFECTION SITES OF APPLE POWDERY MILDEW AND ITS SIGNIFICANCE IN MANAGEMENT STRATEGIES. L. P. Berkett, K. D. Hickey.

At Northeast Division meetings held at Penn State in November, the following papers were presented by graduate students:

IMPACT OF SIMULATED ACID RAIN TREATMENTS ON YIELD OF POTATO. C. J. Army, E. J. Pell, L. S. Evans, K. F. Lewin.

THE EFFECTS OF ATRAZINE RESIDUES ON THE APPARENT INFECTION RATE OF POWDERY MILDEW OF WHEAT. G. R. Watson, H. Cole, J. A. Frank.

FURTHER CHARACTERIZATION OF DOUBLE-STRANDED RNA ASSOCIATED WITH LA FRANCE DISEASE. M. P. Wach, C. P. Romaine.

RNA POLYMERASE ACTIVITY IN A VIRUS-LIKE PARTICLE-ENRICHED FRACTION FROM AGARICUS BISPORUS. A. Sriskantha, C. P. Romaine.

AN ANALYSIS OF THE VIRUS-LIKE PARTICLES ASSOCIATED WITH LA FRANCE DISEASE. Karen Koons, L. C. Raid, C. P. Romaine.

DOUBLE-STRANDED RNA IN THE CULTIVATED MUSHROOM: INCIDENCE AND VARIATION. M. P. Wach, C. P. Romaine.

SUSCEPTIBILITY OF PONDEROSA PINE TO ENDOCRONARTIUM HARKNESSII IN PENNSYLVANIA. N. Wenner, W. Merrill, B. Towers.

INCUBATION PERIOD OF SEPTORIA CANKER AND LEAF SPOT ON INOCULATED POPULUS HYBRIDS. R. Long, T. W. Bowersox, W. Merrill.

RELATIONSHIP BETWEEN COLONY NUMBER, TOTAL SPORULATION/LEAF AND RECEPTIVITY IN POWDERY MILDEW OF WHEAT. J. R. Pelletier, R. D. Schein.

EAR ROT OF SWEET CORN CAUSED BY FUSARIUM SPECIES. N. L. Fisher, L. V. Gregory, J. E. Ayers.

THE USE OF DISEASE INCIDENCE TO ESTABLISH SUB-LETHAL DOSAGES OF SYSTEMIC FUNGICIDES TO MANAGE PLANT DISEASES. R. R. Nelson, R. D. Schein, G. Thomas, O. Borges, M. Royer.

POPULUS AS A MODEL FOR STUDYING DEFENSE MECHANISMS IN BARK--CHARACTERIZATION OF COMPONENTS. A. R. Biggs, W. Merrill, D. Davis.

EFFECT OF BLIGHTED CULL PILES IN THE MANAGEMENT OF POTATO LATE BLIGHT THROUGH BLITECAST. A. B. Molina, D. R. MacKenzie.

O₃ RESPONSE OF POTATO LEAF PROTOPLASTS FROM TWO DIFFERENTLY TOLERANT CULTIVARS. B. L. Illman, E. J. Pell.

ASSOCIATIONS BETWEEN THE EFFECTS OF SPRING NITROGEN LEVEL ON DISEASE SEVERITY, YIELD, AND YIELD COMPONENTS OF WINTER WHEAT. S. C. Broscious, J. R. Fredrick, J. A. Frank, H. G. Marshall.

THE INFLUENCE OF THE INTERACTION OF HOST AND PATHOGEN GENOTYPES ON THE RESIDUAL EXPRESSIONS OF "DEFEATED" MAJOR GENES. M. H. Royer, R. R. Nelson.

THE RELATIONSHIP BETWEEN RACE FREQUENCY AND PARASITIC FITNESS. M. H. Royer, R. R. Nelson.

INFECTIVITY OF ECTOMYCORRHIZAL SPAWN PRODUCED BY THE BUTLER COUNTY MUSHROOM FARM, INC. J. M. Genua, W. Merrill, L. C. Schisler.

FORMATION, PURIFICATION, AND REGENERATION OF PROTOPLASTS FROM AGARICUS BRUNNESENCENS. M. Spear, D. J. Royse.

Several students also attended the National meetings in Salt Lake City and presented these papers:

APPLY POWDERY MILDEW DISEASE PROGRESS ON INTERVALS OF SHOOT GROWTH: AN ANALYSIS OF LEAF MATURATION AND FUNGICIDAL EFFECTS. N. Lalancette, K. D. Hickey.

THE EFFECT AND SIGNIFICANCE OF 'LATE SEASON' APPLE POWDERY MILDEW. L. P. Berkett, K. D. Hickey.

THE EFFECTS OF ATRAZINE ON YIELD COMPONENTS AND DISEASES OF WINTER WHEAT. G. R. Watson, H. Cole, Jr., J. A. Frank.

EFFECTS OF WINTER WHEAT MANAGEMENT PRACTICES ON POWDERY MILDEW AND SEPTORIA LEAF BLOTCH SEVERITY. S. C. Broscious, J. A. Frank, H. G. Marshall.

EFFECTS OF RADIATION ON THE GERMINATION OF ALTERNARIA SOLANI CONIDIA. R. E. Stevenson, S. P. Pennypacker.

News of Alumni

Dear Alumni and Friends:

It was good to hear from so many of you and to get a "First Hand" account of some of your activities. Since the primary purpose of our newsletter is to report and keep in touch we are pleased to share these bits of information with you. As our Department has grown, so has our outreach, and it is doubtful if there are many phytopathological meetings or research institutes which deal with plant diseases where Penn Staters cannot be found.

From Hyderabad, India and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), BARRY NOLT (Ph.D.'81) writes "Judy and I have finished 14 months working at ICRISAT and plan to be here until September 1983. Judy is continuing her work in the Microbiology section looking at the effect of sorghum and millet root exudates on associative nitrogen-fixing organisms. I am continuing my work on groundnut/peanut viruses. My primary research interests involve the soil-borne vector, studying the morphological and chemical properties of the viron, determining the serological relationships of PCV with other soil-borne viruses and developing a reliable method of screening groundnut lines for resistance or tolerance to PCV. We have found working at ICRISAT and living in India a very enjoyable experience. We've made many new friends, visited a lot of interesting places and have had a chance to experience life in a completely different culture." Being avid football fans, and of course loyal Penn Staters, Barry says, "We listen to as many games as possible over the Armed Forces Radio network and await the Sugar Bowl with great anticipation."

Information from Dr. P. L. PATIL (M.S.'71) who is now Agricultural Bacteriologist, College of Agriculture, Pune, India, reports attendance at the 3rd International Conference on Plant Pathology in India in late 1981 and the presentation of a paper "Effect of Viruses on Nodulation in Soybean." He is presently advising three students in their research programs.

JAIRO CASTANO (Ph.D.'81) is now working as a Post-Doctoral Fellow in the rice program at CIAT in Colombia. He reports that it is a tropical paradise for pathogens--but he is hopeful for resistance to at least one of the important problems (virus, blast, grain discoloration, and leaf scald) within a year. He also admits to just a bit of homesickness for "Happy Valley" and environs. We're glad he remembers "the good times."

DAVID ANZOLA (M.S.'78) is no longer working for FUSAGRI (Fundacion Servicio Para el Agricultor) as a vegetable pathologist but has recently joined a private Venezuelan company, Agro-Islena C.A., working with pesticides. His recent travels took him to Oxford, England where he attended an International Workshop on Pathogens Transmitted by Whiteflies and to which he presented a paper on "Tomato Yellow Mosaic Virus," a serious problem in Venezuela. (By way of passing, it can be truthfully said that Dr. Romaine's parties are not quite the same now, without David's pina colada--especially the ones with mushrooms!)

SAMUEL DALMACIO (Ph.D.'76) is now Assistant Professor, Department of Plant Pathology, University of The Philippines at Los Banos, where he is teaching three courses in Plant Pathology and advising seven students (3-B.S., 3-M.S., and 1-Ph.D.). In addition he is serving on the committees of 32 other graduate students. His graduate course on "Disease Resistance" initiated in 1977 has proved the most popular course in Plant Pathology with as many as 55

students and an average of 30 per semester. It appears an already full schedule is rounded out with a research program in sorghum improvement which includes five projects and cooperation with ICRISAT and Texas A & M University and a current tie-in with INTSORMIL (International Sorghum and Millet Program) based at the University of Nebraska. Since his return to the Philippines, Sam has been abroad twice, the 1978 International Workshop on Sorghum Diseases at ICRISAT, Hyderabad, India, and The Corn Improvement Workshop held in Suweon, South Korea in 1979, where he presented a paper on "Breeding for Disease Resistance in Corn." Wife, Ida (Ph.D. Penn State, 1976) is an Assistant Professor of Microbiology in the College of Arts and Science and keeps busy with teaching, research in food microbiology at The National Institute of Biotechnology and Applied Microbiology. Anthony Charles (8) now in third grade, and Charlene (5) in nursery school we hope will be Penn Staters also.

CARLOS MEYER (Ph.D.'72) maintains his base of operation in Montevideo, Uruguay as a Plant Pathology Specialist with IICA (Inter-American Institute for Cooperation on Agriculture). One can only envy him as the Southern Hemisphere moves into Summer and the fruits thereof. Who indeed has ever tasted the pears or filet mignon of Uruguay without a bit of nostalgia and gastronomic stimulation. Carlos, with the experience of a recent revolution behind him, states that he "continues to play ball but without a fever to win, for that is the best and most direct way to be a loser." Good advice, I must admit.

Many of our U.S. respondents are taking to the international route it would seem, which suggests that should you be headed in their direction and wish to see them, you should first ascertain they will be home.

JAMES DEMSKI (Ph.D.'66) is now working on peanut virus diseases in Georgia and Developing Countries in Africa as a result of a 5-year grant (Title XII,

Peanut CRSP). Jim will spend two months each year in Africa working primarily on groundnut rosette. The initial work will be in Nigeria (Ahmadu Bello University) with later trips to Senegal, Sudan, Cameroon, Malawi and The Ivory Coast. Home base continues to be Experiment, Georgia.

DONALD SMITH (Ph.D.'66) was recently promoted to Professor of Plant Pathology, Texas A & M University and is still stationed at Yocum, Texas. During 1982, Don spent a week in The Netherlands, a month in the Republic of South Africa, and a week in Brazil. With Morris Porter and R. Rodriguez-Kabana he will edit the APS Compendium of Peanut Diseases to be published in 1983. He will also be working on pod rot and leaf spot resistant genotypes with collaborators in Senegal. Daughters Donna and Debbie are at North Texas State and University of Texas, respectively. Son Scot will soon be joining sister Debbie at Austin. Meanwhile Bobbie is working full time in the medical records section of the local hospital--for you know why, even though it is widely rumored that "Texas Professors are really in the chips."

BARRY CUNFER (M.S.'67) continues to call Experiment, Georgia his academic home. In October 1982 he participated in The International Symposium on Seed Pathology, Copenhagen, Denmark and presented an invitational paper on the seed-borne phase of Septoria nodorum. While in Copenhagen he visited with Dr. Smedegard Petersen, also a former Penn Stater. Enroute he visited the Plant Breeding Institute at Cambridge, England and the Welsh Plant Breeding Station, Aberystwyth, Wales. He presented a seminar at The University College of Wales and conferred on glume blotch of wheat and other small grain diseases. In-country travel involved a trip with son Jeff to Philmont Scout Ranch, Cimmaron, N.M., with stop-overs at Carlsbad Caverns and NASA in Houston. Jeff (16) plays clarinet in the Griffith High School Band. Daughter Allison (12)

was involved in a summer program for gifted children at Western Carolina University, Cullowhee, N.C. Wife Pat is preparing for her sixth annual Christmas pottery show and sale. In September she assisted several well-known potters at the Folklore Pavilion at the World's Fair, Knoxville.

RICHARD LATIN (Ph.D.'76) has moved from the far west to Purdue University where he is now Assistant Professor of Plant Pathology with major responsibility in extension. For those who might have an interest in mangoes the following announcement may prove of special interest. Although it's been about 5 years since they last worked together in graduate school, Drs. L. L. Burpee, L. V. Gregory, and R. X. Latin are renewing their interests in mango disease research. They are in the process of assembling an extensive literature review. The trio plans a formal reorganizational meeting at the 1983 National APS meetings in Ames, Iowa. Alumni interested in joining the group can obtain an application and further information by sending \$25.00 to:

Dr. R. X. Latin, Chairman
Mango Research Social Committee
Department of Botany and Plant
Pathology
Purdue University
West Lafayette, IN 47907

GARY EMBERGER (Ph.D.'81) has had a recent change of address but continues to teach biology at Messiah College in Grantham, PA (near Harrisburg). His new address is 7 S. George Street, Mechanicsburg, PA 17055, where wife Sylvia is busy with homemaking and keeping up with son Michael (22 months).

RODNEY VARGO (M.S.'76) is continuing his graduate work in plant pathology at The University of Minnesota.

EDGAR G. REX (M.S.'25), who since retiring from the New Jersey State Department of Agriculture, now lives at R.D.3, New Tripoli, Pa. He indicates he is still functional but "rusticating."

WILLIAM STAMBAUGH (Ph.D.'57) and wife Shirley were visitors on campus August 17-19 to attend the 75th Anniversary of Forest Education at Penn State. Bill has been associated with the School of Forestry and Environmental Studies since leaving our faculty 20+ years ago.

JAMES TAMMEN, many years a faculty member and Department Head before becoming Dean of Agriculture in frigid Minnesota, has returned to the more hospitable climate of Pennsylvania as President of Oglevee Associates--Connellsville. Jim reports that the past year has been exciting, "Learning about the specialist propagators business in the United States, Canada and Europe; trying to catch-up on the tremendous developments in the field of floriculture that have occurred over the past 10-15 years; and renewing old and good friendships. Marilyn had a difficult time getting her heart to function as it should. She went through the paces at the Mayo Clinic and again at the Pittsburgh Medical Center, but the results in terms of 'diagnosis, prognosis and control' are excellent and she is now back to normal." Daughter Jeanne still lives in State College and will, we are sure, serve as a strong attraction for Jim and Marilyn to visit State College more than might be otherwise--and to the benefit of friends here. Daughter Jan is living in Reston, Virginia, and is to be married in March to a State College High "steady," Jim Menocher.

WEBSTER A. CHANDLER writes that he retired January 1, 1982, but is "as busy as ever with a small peach and apple orchard a few miles from here. I have continued to work on some unfinished publications also. In August and September Peggy and I took a trip west, visiting Yellowstone, Lake Tahoe, Yosemite, Grand Canyon and other points of interest - a long awaited trip and much enjoyed by both of us!"

HENRY POPP who retired in 1958 as Head of Botany and Plant Pathology recently celebrated his 90th birthday. Dr. Popp still enjoys gardening but reported a rather disappointing crop of tomatoes this past summer. He hopes 1983 will be better.

FRED LEWIS who retired in 1975 as Scientist in Charge, Fruit Research Laboratory, Biglerville, is enjoying the freedom which retirement permits. "Now I set my own schedule and work only on those things which interest me. Since retirement, I have published several papers on fruit diseases, researched and published a book on my Lewis ancestors and tried to make myself useful as a Director of the South Mountain Community and Fair Association" (and he has). While he and wife Elizabeth travel each year, Arendtsville continues to be home base with strong contacts with the fruit industry and the lab.

Obituary

We are sorry to report that Helen Ishler died on February 10, 1983 after an extended illness. Helen retired in 1977 after working seventeen years in the Department as a laboratory technician. In addition to keeping us supplied with media, she brewed many a pot of coffee and taught the fine art of assorted needlecrafts to numerous coworkers and students. We will miss her. She is survived by her husband, Budd, and a daughter and son.

We hope you enjoy your annual Newsletter. If you have comments or suggestions, please let us know. Also, please drop us a note if your address changes so that we can keep our files up to date. Thanks!

Newsletter Committee
211 Buckhout Laboratory
University Park, PA 16802

Roster

<u>Name</u>	<u>Degree</u>	<u>Advisor</u>	<u>Research Interest</u>
ARNY, Carol	M.S.	E. J. Pell	Stress ethylene production in response to acid rain
BAIR, Wendy	M.S.	J. E. Ayers	Breeding disease resistant plants
BARCLAY, Gerald	M.S.	L. C. Schisler	Thinning compounds for <u>Agaricus bisporus</u>
BERKETT, Lorraine	Ph.D.	K. D. Hickey/ H. Cole	Integrated pest management
BOLGIANO, Nicholas	Ph.D.	S. P. Pennypacker	Crop loss assessment
DELSEERONE, Leslie	M.S.	J. A. Frank	Small grains
DIEHLE, Douglas	M.S.	D. J. Royse	Mushroom research
FISHER, Nancy	Ph.D.	T. A. Toussoun/ P. E. Nelson	Taxonomy and pathogenicity of <u>Fusarium</u> species
FREEBORN, Rita	M.S.	S. P. Pennypacker	Vegetables
GETTIG, Russell	Ph.D.	W. J. McCarthy	Insect virology, molecular biology
HORNA, Sheryl	M.S.	D. J. Royse	Mushroom strain analysis
HUNT, Greg	M.S.	J. R. Bloom	Pine wilt disease, the host range and population dynamics of a local isolate of pine-wood nematode
ILLMAN, Barbara	Ph.D.	E. J. Pell	Differential tolerance of potato cultivars to ozone
KIM, Choong Hoe	Ph.D.	D. R. MacKenzie	Plant disease management
KOONS, Karen	M.S.	C. P. Romaine	Biochemical characterization of viruses associated with La-France disease of <u>Agaricus bisporus</u>
LALANCETTE, Norman	Ph.D.	K. D. Hickey/ S. P. Pennypacker	Epidemiology/Disease management
LONG, Robert	Ph.D.	D. D. Davis	Forest pathology
MOLINA, Agustin	Ph.D.	D. R. MacKenzie	Management of potato late blight through host resistance, sanitation & predictive system of fungicide application
MOLINA, Gloria	M.S.	J. R. Bloom	Interaction of root knot nematodes and <u>Fusarium</u> root rot on alfalfa
MORELLI, Laurie	M.S.	P. E. Nelson	Histopathology of chrysanthemums infected with CSV and a <u>Fusarium</u> spp.
PELLETIER, Jean-Robert	M.S.	R. D. Schein	Epidemiology - Analysis of components and resistance
PEREZ, Julian M.	Ph.D.	D. R. MacKenzie	Epidemiology
RAID, Richard	M.S.	S. P. Pennypacker	Epidemiology
SIGULAS, Kristen	M.S.	R. R. Nelson	Horizontal disease resistance
SIM, Susan	M.S.	K. T. Leath	Resistance to bean yellow mosaic virus in red clover
SMALL, Dan	M.S.	T. A. Toussoun	<u>Fusarium</u> foot and root rot of tomatoes
SPADAFORA, Vincent	Ph.D.	H. Cole/J.A. Frank	Cereals disease research
SPEAR, Mark	M.S.	D. J. Royse	Fungal genetics and breeding, genetic engineering
SRISKANTHA, A.	Ph.D.	C. P. Romaine	Viruses
THOMAS, Garfield	Ph.D.	R. R. Nelson	Disease resistance, epidemiology
WACH, Mark	M.S.	C. P. Romaine	Mycoviruses
WENNER, Nancy	M.S.	W. Merrill	Christmas trees
ZANG, Larry	M.S.	W. Merrill	Conifer needlecasts

APS Participation

Past and present Penn Staters continue a high level of participation in APS. Committee members include:

<u>Committee</u>	<u>Names</u>
Bacteriology	F. Lukezic
Disease & Pathogen Physiology	(L. D. Moore, Ph.D.'65)
Diseases of Ornamental Plants & Turfgrasses	(L. Burpee, Ph.D.'79)
Epidemiology	(L. Madden, Ph.D.'80)
	(D. Rouse, Ph.D.'79)
	(T. Starkey, Ph.D.'77)
Forest Pathology	D. Davis
Genetics	J. Ayers
	D. MacKenzie
	R. Nelson
Mycology	D. Royse
Plant Disease Detection	S. Pennypacker
Plant Disease Losses	S. Pennypacker
	(R. Latin. Ph.D.'80)
Plant Virology	P. Romaine
	(S. Tavantzis, Ph.D.'80)
Pollution Effects on Plants	(R. J. Kohut, Ph.D.'75)
	(L. W. Kress, M.S.'72)
	(L. D. Moore)
	E. J. Pell
Postharvest Pathology	(D. S. Shriner, M.S.'69)
Seed Pathology	(R. A. Spotts, Ph.D.'74)
	(L. Castor, M.S.'75)
	J. A. Frank
Soil Microbiology & Root Disease	K. T. Leath
Women in Plant Pathology	(R. A. Schmidt, Ph.D.'64)
	S. H. Smith
Placement	D. D. Davis
Collections & Germ Plasm	T. A. Toussoun
Illustrations of Plant Pathogens & Disease	(L. W. Kress, M.S.'72)
	A. A. MacNab
Industry	(R. Kaiser, Ph.D.'80)
International Cooperation	R. D. Schein
New Fungicide & Nematicide Data	H. Cole
	(R. A. Hamlen, Ph.D.'71)
	W. K. Hock
	K. D. Hickey
Phytopathological Classics	R. S. Dickey
	W. Merrill
Public Relations	K. T. Leath
	(J. W. Moyer, Ph.D.'75)
Regulatory Work & Foreign Plant Diseases	C. H. Kingsolver
Standardization of Common Names for Plant Diseases	F. L. Lukezic

S p o n s o r s

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BFC Chemicals, Inc.
Bonaparte Peat
Castle & Cooke, Inc.
Centre CETA
CIBA-GEIGY Corporation
Country Kitchen Foods, Inc.
Diamond Shamrock Corporation
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