Voices From The Future

Thoughts on optimal preparation of plant pathologists from current graduate students and young professionals

We live in a post-industrial information-age society, but life in a post-agricultual society is improbable! As heterotrophs we depend on crops for healthy and nutritious food.

*-**Olufemi J. Alabi**, Ph.D. student*
Washington State University

Attracting the Best

We need to find unique ways to attract, retain, and mentor students in the field of plant pathology. To attract the best and brightest to the field, we have to start early (K-12) and we need to tap into real-time communication networks where these students live. Computers, cell phones, ipods, and PDAs keep students connected in near real-time to viral videos on YouTube, interactive Facebook networks, Twitter instant messages, and MySpace portals. If we are going to set the hook early, graduate programs need to broaden their coverage and participation right away.

***-David Schmale**, Assistant Professor,*
Virginia

Many students feel that plants, agriculture and plant pathology are irrelevant to their education and future careers. I address this by threading a plant pathology theme through my courses that highlights career opportunities and cutting edge research while demonstrating how students are directly impacted by phytopathological issues.

*-**Maryann Herman**, Asst Prof of Biology*
New York

I was introduced to plant pathology only because my virology instructor in the biological sciences department was replaced at the last minute with a virology instructor from the plant pathology department, and she decided to announce to the class that there was a summer internship opportunity. There should be more targeted ways than that for undergraduate students to find out about plant sciences.

***-Anonymous** recent graduate*
Working in industry

One of the best investments the APS could make is to broaden its visibility to undergraduates. Ideally, every department of biology, microbiology, and plant sciences in the country should be receiving materials from the APS, highlighting the contributions of plant pathologists and career opportunities available in phytopathology. Every career services department should be able to tell interested students what summer jobs and graduate positions are available in phytopathology research, and we should try to expand summer research opportunities for students at non- land-grant institutions. Casting a wide net will help us compete for the best and brightest, and is an important first step in ensuring the long-term future of plant pathology.

***-Lindsay Triplett**, Ph.D. student*
Michigan State University

The marketing of plant pathology needs to be improved at the undergraduate level. Many undergraduates view plant pathology as a specialized discipline. However, just the opposite is true. Plant pathology is an interdisciplinary field with the potential to attract students interested in the molecular biology, ecology, biochemistry, and physiology of host-parasite interactions. I would encourage APS and plant pathology departments to improve the marketing of regional and national APS meetings. A travel award competition could attract undergraduates, and their registration fee could be waived. Undergraduates could conduct small independent research projects and a special poster-session could highlight their research.

*-**Anonymous**, Ph.D. student*
University of Minnesota

Phytopathology has the potential for broad appeal, but the subject gets very little "face time" with undergraduates. Many talented science majors care deeply about issues of global food security and the environmental impact of agriculture, but are simply not aware of the impact that phytopathologists have made in these areas. Anecdotal evidence suggests that undergraduate interaction with plant pathologists can be a powerful recruiting tool; tiny colleges like Goshen or Carleton with plant pathologists on staff decades ago have each produced a sizeable handful of current APS members. I know I would never have become involved in plant pathology had it not been for my summer research experiences.

***-Lindsay Triplett**, Ph.D. student*
Michigan State University

Drawing on the values upon which our field is based will help us attract the next generation of plant pathologists. For example, many students who want to become doctors do so because they want to help people. Plant pathology helps people by solving problems related to hunger and famine. We can appeal to the same value. Our field is an integrated science where biochemistry, genetics, and ecology not only peacefully coexist, but function together in complete, complex systems, so let's bring more biochemists, geneticists and ecologists to plant pathology.

***-Dija Selimi**, Post-doctoral fellow*
University of Wisconsin-Madison

We need to educate The Millennial Generation that food is produced by plants and that agriculture is as vital as internet, cell phones or text pagers. This needs a paradigm shift from "traditional" classroom teaching to a stimulating environment for attracting the young generation to agriculture and Plant Pathology. A variety of contemporary teaching methodologies and communication technologies in conjunction with hands-on experiences with plants and plant disease problems will generate interest in Plant Pathology and attract Millennials to the science of Plant Pathology.

*-**Olufemi J. Alabi**, Ph.D. student*
Washington State University

My choice of plant pathology as a career path puzzled many of my classmates. Few of them understood plant pathology, and even fewer had the opportunity to be introduced to the discipline as I was. All of my fellow plant science classmates suffered through a semester of monotone lectures that failed to stimulate their weary craniums.

I am lucky to have had such a positive introduction to plant pathology. My diverse training included both basic and applied research, and my dissertation project had a major field component. I often find myself working late to satisfy my curiosity or volunteering for project after project just for fun. Is enthusiasm contagious? Definitely. There is no doubt that I view microbial interactions as nothing less than exhilarating.

*-**Nicole Ward**, PhD candidate*
Louisiana State University

The field of plant pathology is overlooked by many exceptionally bright and competent students simply because they are not aware of its existence and importance. As a person who inadvertently stumbled upon this field, I wonder how many potentially great plant pathologists are utilizing their talent on other pursuits. I believe that with an appropriate outreach effort the field of plant pathology could drastically increase the number and caliber of students applying to graduate programs.

***-Jessica Williams**, Ph.D. student,*
Texas A&M University

A Balanced Education

I have met students who can tell you anything you want to know about a pathogen's DNA sequence, but could not identify that pathogen under a microscope.

***-Kassie Conner,** Ph.D. student*
Auburn University

As a member of private industry, I am aware of the need for students to be exposed to various allied disciplines (entomology, plant physiology, soil science, chemistry, etc.) during their graduate program. For example, knowledge of entomology and soil science is used routinely in my current position since insect ID and soil nutrient testing are also part of our diagnostic services.

***-Eric Honeycutt**, Diagnostic Services*
Manager, Private company, North Carolina

Molecular biology and biochemistry always lead to the new findings in plant-microbe interactions…[but]…plant pathology should always be related with practical fields such as agriculture or horticulture so that it is kept on the right track to be applied to solve problems for human need.

***-Yuntao Dai**, Ph.D. Student*
University of Arkanasas

Regrettably, courses in diagnostics or courses that have any focus on disease identification, have been rare. As the president of the graduate student club I organized an afternoon where graduate students presented their projects in the lab, greenhouse, or field. When we visited the field, few students had any experience in the field that allowed them to recognize plant diseases in common crops. I feel that this is a major shortcoming. If we are graduating as plant pathologists, we should have more exposure to these experiences than just sitting in a classroom and looking at pictures.

***-Adam Sparks** Ph.D. student*
Kansas State University

The next generation of plant pathologists should have opportunities to develop connections to their world. Students should travel abroad to experience agricultural production systems that are different than those in the United States. Plant pathologists should cultivate sensitivity to the needs and limitations of producers that is more than abstract. This quality of sensitivity, and making the producer's plight our plight, is part of our tradition, and it is something worth instilling in subsequent generations of plant pathologists.

***-Dija Selimi**, Post-doctoral fellow*
University of Wisconsin-Madison

A main challenge for graduate education programs in plant pathology is finding the answer to the dilemma of either providing a molecular, ultra-specialized, or a broader, field- oriented course of instruction. However, it is important for us all to realize that the design and effective implementation of plant disease management strategies needs the foundation of basic tools and research that could help address questions having practical, applied implications.

***Silvina L. Giammaria**, Head of Plant Pathology & Leader for Sugarcane Diseases, EEAOC, Argentina*

The majority of American plant pathology graduate programs are extremely focused on basic research and molecular biology, leaving aside the applicability of such studies and the subject of plant pathology. The result is that these graduate students end up having a lot of difficulties in pursuing opportunities in industry because of their lack of field and "real plant pathology" experience. As a recent graduate, I experienced this by myself, hearing on several occasions that I was "too academic" for the positions available.

*-**Alexandre Silveria Mello**, Post-doctoral Fellow, Cornell University*

Why are courses in advanced mycology, forest pathology, epidemiology, tractor and field equipment use, and microscopy noticeably lacking in curriculum across the country? Are we training a future generation of investigative scientists, or highly specialized lab technicians who can only pursue a career that is in the same area as their dissertation work? Is specialization really an asset if it replaces general training at the graduate level? This is an area of concern that deserves attention at the national level.

***-Michelle Moyer**, Ph.D. student*
Cornell University

While I've received I broad education, a few courses were not taught during my 4 years of grad school due to the lack of available instructors. This is a concern, especially since the economic downturn has caused many universities to slash budgets, eliminate positions and impose hiring freezes. To combat this problem, I took a course taught from another university on the web…we have observed how pathogens spread worldwide. Now is the time for plant pathology education to follow suit, leaving better equipped, broadly trained and confident professionals in its wake.

-Katelyn Willyerd, Ph.D. student
Pennsylvanis State University

The next generation of pathologists needs to be taught a combination of hands-on, field related work combined with molecular skills and technology. Students need to be constantly exposed to diagnosis and real-life problems… Exposure to international scientists and their pathology issues expands one's horizons and leads to understanding and cooperation.

*-**Jill Breeden**, MS student*
Auburn University

Plant Pathology has its historical roots in agriculture and will continue to maintain this connection. In recent decades research and education has shifted from an applied approach to a more basic approach, leading to a widening gap between Plant Pathology and Agriculture. The shift is due, in part, to technological advances in science, changes in support from funding agencies, and the narrow focus of faculty research. Maintaining relevance is essential for the long term viability of this field of study.

***-Greg Church**, County Extension Agent*
Texas

Professional Growth

Students are taught how to be a scientist, but not the business side of the profession.

***-Curtis Colburn**, Post-doctoral fellow*
Clemson University

Graduate students receive hands-on training, learn to critically analyze literature and write scientifically, and usually serve as teaching assistants for one semester. These skills are not sufficient to mold well-rounded scientists. I feel a greater emphasis on career options and preparation is needed. Specifically, I would focus on areas such as: improving communication skills (especially with members of the non-scientific community), developing collaborations and strengthening leadership, whether it is running a classroom, lab or field crew.

*-**Maryann Herman**, Asst Prof of Biology*
New York

If I could improve anything in my educational experience, it would include receiving more experience in grant writing. APS should put together a program in which graduate students can compete for grants, written on their own, to help fund their research. My lack of experience in this area is the only reason I could imagine I would not be prepared for my first job.

***-Kassie Conner,** Ph.D. student*
Auburn University

I wish our universities would teach us to become successful professionals in Plant Pathology. In addition to the regular course work and research, students should be taught professional development, research ethics, community service, and grant proposal writing. Graduate students and early career professionals should be helped to attend some professional meetings and scientific conferences so they can learn about the science and also interact with other graduate students and research scientists.

***-Rishi Ram Burakoti**, Post-doctoral fellow*
North Dakota State University

Many graduate students are being extremely well trained in doing research within their specialty but do not receive nearly as much training in communication, teaching, mentorship, how to successfully write grants etc. unless they have an advisor that specifically trains them to develop these skills or the student actively pursues these goals themselves. These skills will be useful to all practitioners of Plant Pathology, regardless of their future career choices.

***-Sofia Windstam**, Post-doctoral fellow &*
Lecturer, Michigan

Most PP students are prepared to conduct research when they enter the work place. However, many have underdeveloped communication and management skills. We often focus on preparing master's students for their PhD, and PhD students for jobs in academia, when in fact many of our students will be entering the private industry sector.

*-**Kirk Broders**, Post-doctoral fellow*
University of Guelph, Canada

The academic realm is insulated from much of the real world. This can leave a student unprepared for the work place. …A student should receive a well rounded education, training, and experience that will make them a marketable candidate for employment. A graduate program should not encourage nor allow a student to focus too heavily in one specialization, because this can severely limit their ability to obtain or perform in their job.

***Greg Church**, County Extension Agent*
Texas

During my professional dealings, I've found that a common critique of science graduates is a lack of "worldliness". For instance, newly minted graduates may bemoan the lack of field replicability because their graduate project was undertaken in the carefully controlled confines of a lab. A modern rubric for instruction should acknowledge and remedy this reality. A compulsory, service-learning term abroad as "plant doctors without borders" would expose students to a diversity of cropping systems, stakeholders, and worldviews. It would present an ideal opportunity to hone case-based critical thinking and improvisational skills. In my opinion, this approach would also address another systematic problem: a curricular overemphasis on genomics and under-emphasis on classical plant disease diagnosis and microscopy.

***-Tim Durham,** Assistant Professor*
Louisiana

I do think I need more tools for facing a real job. I need to polish up my scientific writing in order to be productive publishing papers. Moreover, most of the time, graduate students lack of preparation for writing grant proposals and we need to learn about budgets, projections and so on. Finally, I think it is common that most graduate students are lab people instead of field people, whereas the ideal and real plant pathologist is both.

*-**Christie Almeyda**, Ph. D. student*
Washington State University

While my thesis work has provided rigorous training, my most valuable career preparation has come from mentoring undergraduates, keeping lab financial records, attending teacher training workshops, serving on departmental and university committees, and writing papers and proposals… These are all activities necessary for preparation for a career in academia or industry, and they are all activities that must be actively sought by students and supported by advisors.

***-Lindsay Triplett**, Ph.D. student*
Michigan State Universit

Out In The Workplace

Plant pathology programs need to show students all the possibilities for careers. Unfortunately universities are focused on the creation of "laboratory researchers," rarely offering in parallel preparation for teaching and field research opportunities. I believe that more opportunities for students to teach and to interact with industry are necessary because this will open more opportunities to graduate students. If we look to other areas like entomology and horticulture, it's possible to observe that their focus is not as restricted as plant pathology. As a result, most industry positions go to students from those areas—even plant pathology positions—because of their broader background.

-***Alexandre Silveria Mello***, *Post-doctoral fellow, Cornell University*

Most graduate students in plant pathology envision their first job would be fundamental research on a particular pathogen and/or plant. I never thought that validation and development of new methods in plant pathogen detection can be just as rewarding as research. Being able to develop effective tools which benefit various stakeholders and protect U.S. agriculture is as rewarding, if not more so. Graduate students should be prepared to anticipate change. They should expect that their roles throughout their careers will change depending on the latest pathogen of interest.

-Kristina Owens, *Plant Pathologist, Government agency, Maryland*

I am greatly concerned about maintaining my knowledge and research skills at levels that are competitive with other scientists worldwide…how I can be "world competitive" once I am far away from the USA…There is a need for mini-classes or short courses dealing with new technologies in biotechnology, bioinformatics, and use of new biomolecular tools. Such short courses should provide students cutting edge knowledge without large expenditures of classroom time [and] could provide an important avenue of "in-service-training" during our postgraduate years

-Ernesto Moya, *Ph.D. student, Montana State University*

A need for applied research still exists in the private sector. The shift away from applied plant pathology may make it difficult for some companies in the private sector to fill positions in research and development. Our company has been affected by this trend over the past several years. We have attempted to address it internally by supporting graduate education of existing early career employees that demonstrate excellence in their work…. applied research is still needed to improve disease control methods and product development.

-Eric Honeycutt, *Diagnostic Services Manager, private company, North Carolina*

Prior to jumping into the job market, it is important for students to interact with professionals in their area of interest to develop connections, gain feedback from an outside source and provide better preparation for interviewing and entering the workforce. Activities such as the student/industry lunch at APS meetings address part of this issue, but could be expanded to include professionals from other career paths or be incorporated into individual graduate programs.

***Maryann Herman**, Asst Prof of Biology*
New York

In my first position in the private sector, I was responsible for all hiring of plant pathologists within my department. This is where I encountered my first frustrations with the status and preparation of students in plant pathology today. I came to find that my personal [broad] educational experience was not necessarily the norm. It was incredibly difficult to find qualified candidates to fill positions, particularly with a Masters or Bachelors education in plant pathology. And few of these candidates could show any experiences outside their thesis work. Nor were they able to demonstrate abilities to work in broad/generalized systems, to learn new tools/methodologies, or any outside leadership experiences. Unfortunately, we often ended up hiring people outside of plant pathology.

***-Kimberly Webb**, Research Plant Pathologist,*
Government agency, Colorado

These remarks were assembled by Jim MacDonald and Caitilyn Allen from the more than 40 applications from graduate students and young professionals to attend a workshop organized by the APS Ad Hoc Committee on the Future of Plant Pathology Education in March, 2009. In some cases, such as the need for broad applied training, they spoke with one voice. But their essays also offered a flowering of fresh creative ideas for ensuring a strong future for our discipline. We are very grateful to them for permission to present their thoughts here.