Department of Plant Pathology

Periodic Program Review

October 2015

Self Study

Department of Plant Pathology
Periodic Program Review
2009–2015
Self Study

Submitted to: Dean Nancy Cox
College of Agriculture, Food and Environment

Submitted by:
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Department of Plant Pathology

September 30, 2015

Department of Plant Pathology Self-Study Report Checklist:

College of Agriculture, Food and Environment Unit Self-Study Report Checklist		
	Academic Department (Educational) Unit Overview:	**Page Number or NA**
1	Provide the Department Mission, Vision, and Goals	Pg. 7
2	Describe centrality to the institution's mission and consistency with state's goals: A program should adhere to the role and scope of the institution as set forth in its mission statement and as complemented by the institutions' strategic plan. There should be a clear connection between the program and the institutions, college's and department's missions and the state's goals where applicable.	Pg. 7
3	Describe any consortial relations: The SACS accreditation process mandates that we "ensure the quality of educational programs/courses offered through consortial relationships or contractual agreements and that the institution evaluates the consortial relationship and/or agreement against the purpose of the institution." List any consortium or contractual relationships your department has with other institutions as well as the mechanism for evaluating the effectiveness of these relationships.	Pg. 9
4	Articulate primary departmental/unit strategic initiatives for the past three years and the department's progress towards achieving the university and college/school initiatives (be sure to reference Unit Strategic Plan, Annual Progress Report, and most recent Implementation Plan)	Pg. 7, 35, 41
5	Department or unit benchmarking activities: Summary of benchmarking activities including institutions benchmarked against and comparison results: • number of faculty • number of students • etc.	Pg. 7
	Faculty and Graduate Students:	
6	Number of faculty and FTE breakdown by DOE, faculty list, brief bios or CVs	Pg. 16, 22, 130
7	Overview of current research program and plans. Describe primary faculty contributions to the three-four strongest research and creative areas in the department.	Pg. 119
8	Describe primary faculty contribution to teaching and service at the department level that have enhanced college and university strategic initiatives.	Pg. 18, 19, 22, 30
9	Describe attrition (cumulative number not tenured, resigned, retired, or other) of the program faculty over the past three years. Discuss the expected effect on program under review and other issues related to ability to retain qualified faculty during the past three years.	Pg. 20
10	List current number of unfilled lines and discuss current actions or plans to fill line. Include general description of "start-up" packages.	Pg. 20
11	Number of graduate students and departmental-level TAs and RAs. List the salary range for TAs and RAs and estimate the number on fellowship for the current or most recent fall semester.	Pg. 13
12	Describe the reasons students reject fellowships or assistantship offered from the university, college, or department/unit**.**	NA
13	Number of postdocs	Pg. 14
14	List of grants and contracts for the period of review, including funding amounts	Pg. 108
15	Faculty fellowships	Pg. 14
16	Faculty honors & recognition	Pg. 48
17	Publication list for period of review, including graduate and undergraduate publications	Pg. 55
18	Undergraduate research activities & initiatives (if applicable)	NA

	Documentation of Implementation of Policies & Procedures: Identify the educational policies and procedures established through faculty governance and responsible parties for implementation. Explain dissemination and transparency.	**Page Number or NA**
19	Evidence of adherence to educational policies and procedures established through the faculty governance process, including consistency in applying policies related to grading, probation, admissions, termination	NA
20	Evidence of consistent review and monitoring of course substitution, course equivalency credits, course substitutions, course transfers toward degree completion, and vetting of exceptions, degree requirements	NA
21	Evidence of adherence to unit procedures on faculty personnel actions (e.g., appointment, promotion and tenure) and budget request preparation	Pg. 192
22	Evidence of course scheduling and teaching assignment	NA
	Academic (Degree) Program Description:	
23	Program demand/unnecessary duplication: • Number of UG and G students enrolled and credit hour production • Number of UG and G degrees conferred • Explanation of how curriculum is different from existing programs at other state institutions or that access to these programs is limited • Explanation of pursuit of collaborative opportunities with similar programs at other institutions and how collaboration will increase effectiveness and efficiency	Pg. 14, 15
24	Program history and background/organizational structure: Critical events/background information which will help in understanding the program currently.	Pg. 7
25	Program uniqueness: Unique components, distinctive innovations. Is the program a response to changes in the discipline or other academic necessities?	Pg. 9
26	Describe how the program is administered (e.g., is there a program coordinator and/or program committee? What is his or her role or function? How do the administrators of the program operate?)	Pg. 192
27	Describe the recruitment and development plan for the program (include attention to faculty, staff, and students).	Pg. 11, 15, 101, 105
28	Program delivery: Review of distance learning course offerings, services and outcomes to ensure compliance with best practices, SACS policies, and federal rules, University Senate and college curriculum committees. Describe flexibility of program delivery. Are classes available at convenient times and in convenient formats for non-traditional students, etc.	Pg. 19, 81
29	Program contributions to undergraduate general education or UK General Education Core	NA
	Program Quality and Student Success: The curriculum should be structured to meet the stated objectives and student learning outcomes of the program.	
30	Student Learning Outcomes Assessment • Evidence of attainment of student learning outcomes for all program delivery, as applicable (e.g., traditional, online, distance education, etc.) • Program assessment of Student Learning Outcomes for graduate programs and undergraduate programs • Assessment results reports and findings for improvement (include evidence) • Evaluation of students' post-graduate success	Pg. 81
31	External awards or other recognition of the students and/or program	Pg. 52, 55
32	Six-year graduation rate	NA
33	Employer satisfaction with graduates as measured by surveys and/or alumni satisfaction	NA
34	Job placement for undergraduate and graduate students or graduate school admission	Pg. 77
35	Pass rates on licensure/certification	NA
36	Describe processes used to ensure currency of curriculum (industry advisory boards, pass rates on licensure, standardized tests, etc.)	NA

37	Describe quality of orientation, advising, other student services/developmental programs, effectiveness of advising, innovations in advising and efforts to improve	NA
38	Instruction: Overview of current instructional program(s) and plans; describe measures of teaching effectiveness and efforts to improve (e.g., faculty development initiatives for instruction, teacher mentor programs) • Class sizes and faculty nucleus for program instruction • Instructional equipment • Faculty credentialing to support core/elective course offering • Internship/independent studies/ co-curricular	Pg. 81, 179, 130, 11, 10
39	Program qualifications/standards for incoming students, program admission	NA
	Program Resources:	
40	Cost and funding of program. Please show detail. • Student credit hour per instructional faculty FTE • Budget summary information and adequacy. Include external funding.	Pg. 19
41	Facilities (description and adequacy)	Pg. 12, 20, 30, 32
42	Equipment (including IT capacity) description and adequacy	Pg. 11, 12, 20, 21, 32, 33
43	Personnel summary and adequacy (faculty and staff numbers, demographics)	Pg. 11, 22-25, 29
44	Support from other university units such as college, research, administration, human resources, development and alumni affairs	NA
	Input from Affected Constituents:	
45	Evaluation data from staff, faculty, students, (e.g., surveys, focus groups, interviews, etc.) Information gathered from accreditation visit/external reviewers and progress updates since last program review (append external review comments for accredited reviews).	NA
	Operations:	
46	Quality of faculty & staff communications and interactions, such as awards/recognitions, opportunities for input, unit meeting schedule, unit retreat schedule, opportunities for faculty and staff to interact, organizational chart	Pg. 24, 48, 192
	Service, Extension and Non-Extension Programs:	
47	Summary of quantity and quality of outreach and community service; interrelationship of public service with research and other aspects of the program; nature and quality of service to the university and discipline	Pg. 29-32, 118, 125
48	Summary of extension programs by topic	Pg. 31, 125
49	Summary of county-level programs	NA
50	Summary of youth programs	NA
51	Summary of community-based programs and training	NA
52	Extension publications, videos, etc.	Pg. 125
53	Evidence of public service activities such as congressional testimony, service on boards	Pg. 130
54	Number of FTE extension faculty and extension specialists	Pg. 22, 25
55	Description and evaluation of outreach, service, and engagement activities	Pg. 125, 186
56	Number of clientele served, programs, and training opportunities	NA
	Other Areas:	
57	Quality Enhancement Plan (Multimodal Communications Across the Discipline): Please indicate program contribution to the goals of the QEP. See http://www.uky.edu/presentationu/	Pg. 10
58	University Diversity Plan: Please indicate ways in which the program contributes to the University's Diversity Plan. See http://www.uky.edu/DiversityPlan/diversity_plan.html	Pg. 26-29

DEPARTMENT OVERVIEW

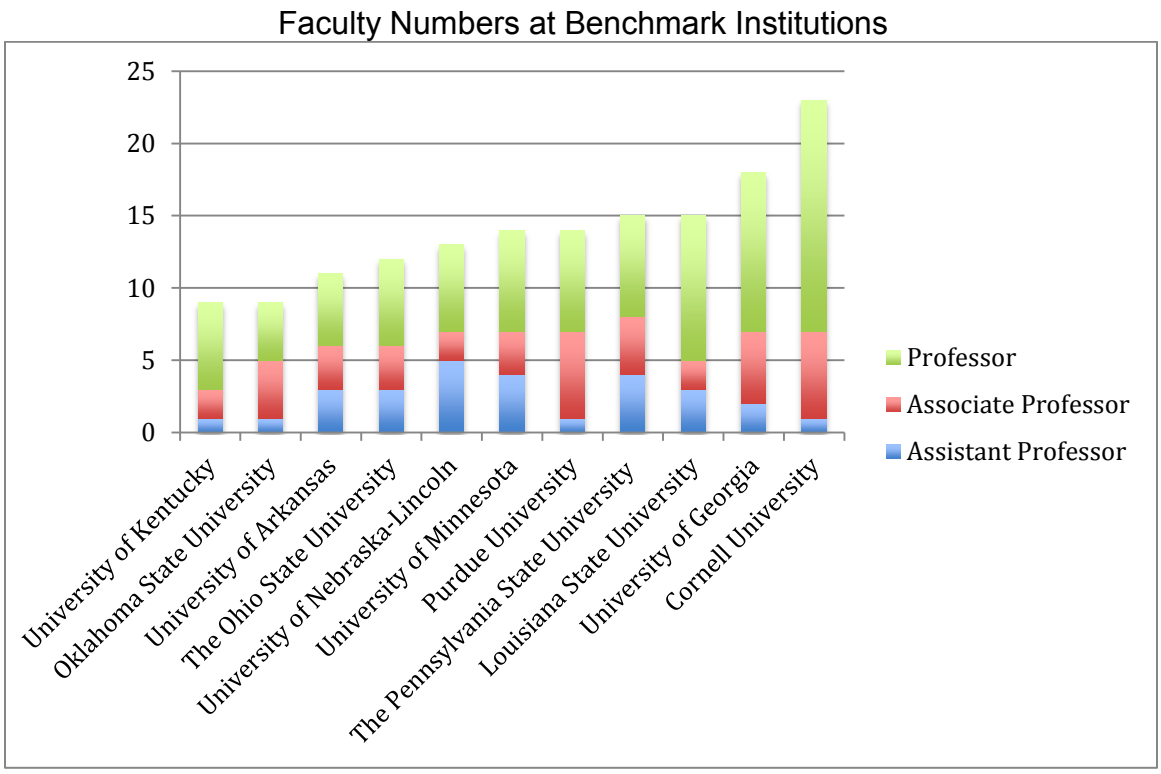
Mission Statement: The Department's mission is to improve understanding of plant disease through research, and to utilize this knowledge to educate students and Kentucky residents about plant diseases. The department will promote plant health throughout the Commonwealth and encourage the use of economical, science-based disease management practices intended also to minimize negative environmental impacts.

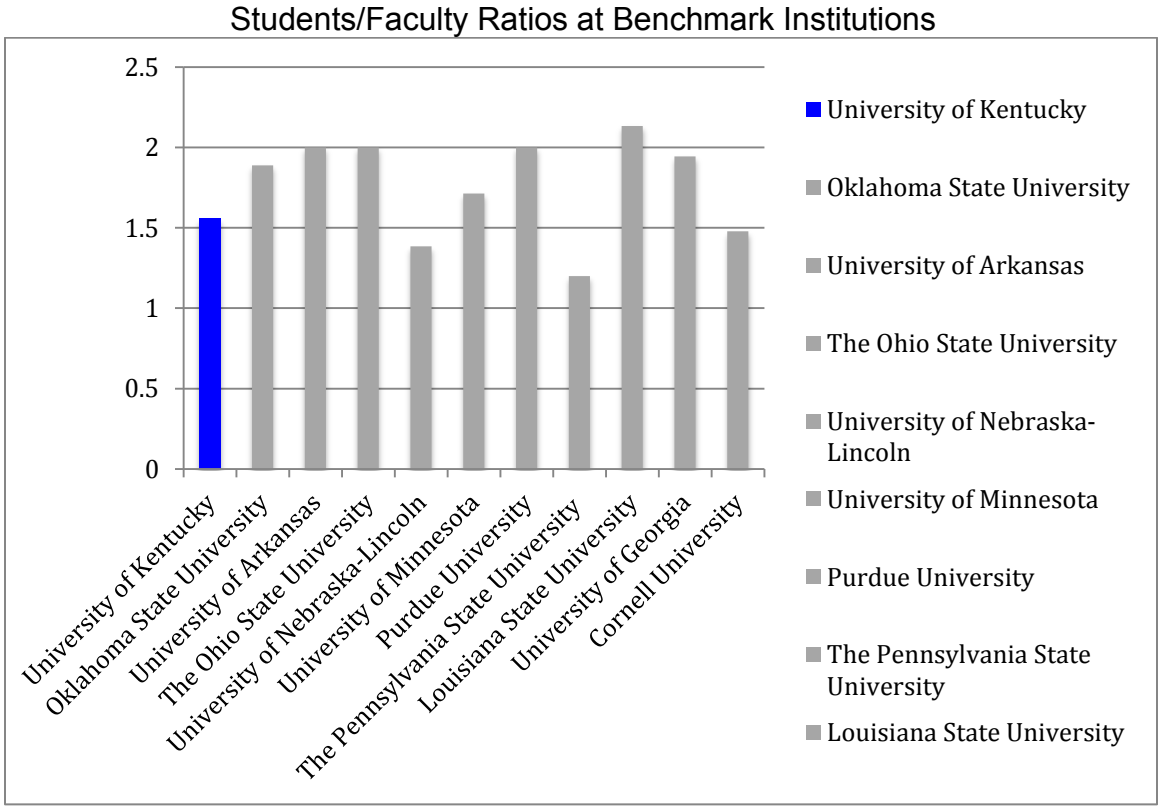
The mission, vision, and goals of the Plant Pathology Department are closely related to teaching, research and extension, the three pillars of the College of Agriculture, Food and Environment, as well as to the mission, vision, and goals of the University of Kentucky. The primary contribution of the graduate degree program is to prepare graduates to be international leaders in the field of plant pathology.

The Department of Plant Pathology was established in 1963 under University of Kentucky (UK) President John W. Oswald, who was a Plant Pathology Professor and an administrator in the University of California system before his appointment as President of UK.

In 2009, the Department crafted a strategic plan (Appendix 1) that was in effect until 2014, when the University discontinued the requirement of strategic plans for academic departments. Currently, the University requires an annual report on the Implementation Plan associated with the most recent periodic program review. The Department's current Implementation Plan report (Appendix 2) addresses 10 recommendations made by the program review committee in 2010. Following the current program review a new Implementation Plan will be crafted based upon the recommendations of the current review committee.

The Department has measured itself against other plant pathology departments in land grant institutions across the United States. These benchmarking activities provide insightful comparisons to the composition of other faculties, as well as student-to-faculty ratios. While the Departmental student-to-faculty ratio compares favorably to other institutions with only three other institutions having lower ratios, the total number of Plant Pathology faculty at UK is lower than any of the benchmarked institutions. The department has a lower proportion of Assistant Professors and Associate Professors in relation to the number of Professors in the faculty in the majority of the benchmarked institutions.


Faculty Numbers at Benchmark Institutions
25
20
15
10
5
0
University of Kentucky
Oklahoma State University
University of Arkansas
The Ohio State University
University of Nebraska-Lincoln
University of Minnesota
Purdue University
The Pennsylvania State University
Louisiana State University
University of Georgia
Cornell University
Professor
Associate Professor
Assistant Professor


Students/Faculty Ratios at Benchmark Institutions
2.5
2
1.5
1
0.5
0
University of Kentucky
Oklahoma State University
University of Arkansas
The Ohio State University
University of Nebraska-Lincoln
University of Minnesota
Purdue University
The Pennsylvania State University
Louisiana State University
University of Georgia
Cornell University

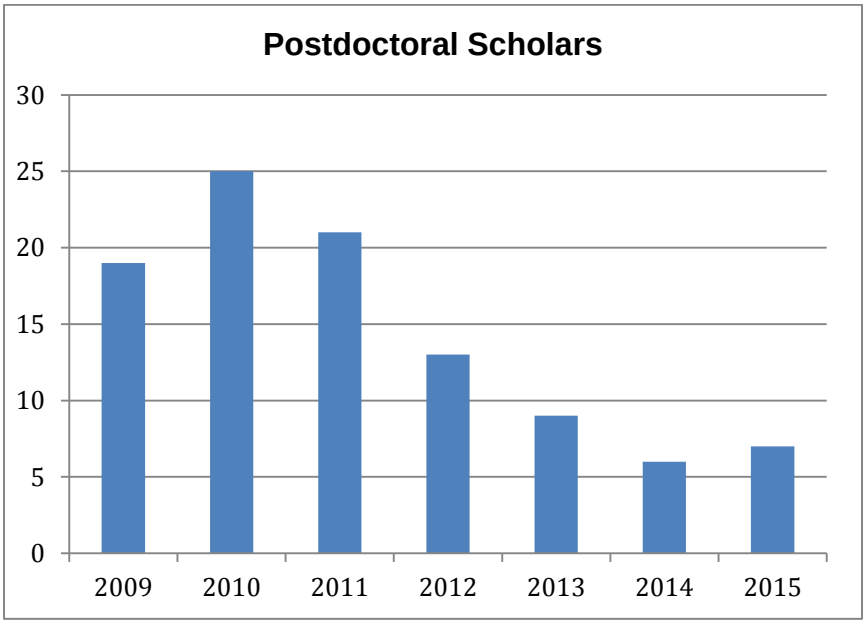
The Department has a history and reputation of excellence in research and extension, having counted among its faculty several fellows of the American Phytopathological Society, many who have received extension, research and teaching awards from that society (Appendix 3), and the only UK faculty member so far to be a inducted into the United States National Academy of Sciences (Robert J. Shepherd, Professor Emeritus).

Traditional research strengths of the Department have been physiology of plant disease and resistance, plant virology, and plant mycology. Over the past six years the Department consistently ranked among the top four, most often as number one, for research productivity in national surveys of plant pathology-related departments (Appendix 4). The Department is also noteworthy for its traditional strength in Extension.

In addition to emphasis on key areas of plant pathology, the Department has more recently developed a strong genomic and bioinformatic component. This is due to a combination of factors including increasing importance of bioinformatics in the discipline, as well as the role of department faculty in initiating and (from 2000–2015) administering the UK Advanced Genetic Technologies Center (AGTC) as a high-throughput sequencing and molecular genetic analysis facility. Similarly, the emphasis of several Plant Pathology faculty members on biological imaging resulted in a successful application to fund a confocal microscope, and to create and administer the Plant Sciences Biological Imaging Center core facility.

The Department offers a Master of Science (M.S.) and a Doctor of Philosophy (Ph.D.) degree, both thesis/dissertation-based. Furthermore, the Department has trained many postdoctoral scholars.

Year	Postdocs
2009	19
2010	25
2011	21
2012	13
2013	9
2014	6
2015	7



The philosophy of the Department is to provide for training and credentials—such as high-quality research publications (Appendix 5)—that enable students and postdocs to maximize their future career opportunities. The discipline lends itself to a wide diversity of career options because it inherently bridges molecular, microbial, organismal and agroecological disciplines within the life sciences. Departmental alumni have obtained positions as research, teaching and extension faculty in colleges and universities, plant disease diagnosticians, staff scientists at research institutes such as NIH and USDA, and a wide diversity of other careers such as a Brewmaster in New Brunswick, Canada, and the Co-founder, Co-owner and Chief Science Officer of Ferm Solutions in Danville, Kentucky (Appendix 6).

The Plant Pathology MS and PhD programs are administered by the Director of Graduate Studies (DGS Lisa J. Vaillancourt), and an Academic Program Committee (APC) chaired by the DGS and including, as members, the Department Chair, two additional faculty members, and a graduate student representative. Elections to the APC are conducted annually in faculty meetings. The APC considers and recommends to the full faculty any changes in required curricula or program procedures such as the conduct of qualifying and exit examinations, which are then voted upon by the full faculty. The APC also decides upon acceptance or rejection of applicants to the MS and PhD programs. The DGS is also responsible for administering the devices for program assessment (Appendix 7). Recently, the DGS was responsible for negotiating and proposing the new dual degree program with Universidade Federal de Viçosa (UFV) in Brazil (Appendix 8).

The recently launched dual degree program with the Departamento de Fitopatologia at the Universidade Federal de Viçosa (UFV) in Brazil (http://www.dfp.ufv.br/) allows PhD students in UFV to complete the requirements for a PhD in Plant Pathology at UK, and vice versa. Dual-degree students at each university must complete the minimum residency requirements for both graduate programs, including coursework at both Plant Pathology departments, and the dissertations must reflect substantial contributions from the student's activities both in the US and in Brazil. By coordinating the prescribed activities at both departments (Appendix 8), the students should complete both degrees in the time expected to complete a PhD degree at UK, but in the process will gain valuable international experience and connections that will make them highly competitive for a wide range of jobs, such as with major agribusiness corporations or with academic departments with emphasis on international agriculture. This program should also attract U.S. students to the Department who may be interested in this unique experience, as well as enhance our graduate and research programs by the participation of Brazilian students.

Although the Department does not offer an undergraduate degree, faculty in the Department are involved in undergraduate education in several ways: instructing an undergraduate Plant Pathology course (PPA 400G Principles of Plant Pathology), hosting and mentoring many undergraduate research interns, providing international experiences to undergraduate students, teaching, advising, and helping to administer interdepartmental undergraduate programs, especially Agricultural Biotechnology

(ABT). Since spring 2013, undergraduate research interns not otherwise enrolled for research credits (e.g., BIO or ABT 395 Independent Study in Biotechnology) are encouraged to enroll in PPA 395 Independent Study in Plant Pathology, and 11 students did so from spring 2013 through Fall 2014. The PPA 395 contract is shown in Appendix 9.

The Plant Pathology graduate courses are listed in Appendix 10. The courses are designed to serve the needs of graduate students in the program and/or County Agents who need additional instruction in aspects of plant pathology (e.g., PPA 640), plant disease management (e.g., PPA 620), and plant biotechnology (e.g., PPA 630/631). Incoming graduate students often lack background coursework in plant pathology, and the lecture/laboratory course, PPA 400G, provides them with that background. Also required for the students are PPA 500, PPA 600, PPA 640 and PPA 641, plus at least two of the four advanced plant pathology courses (PPA 650, 670, 671 and 673). Typical PPA course enrollment numbers range from 2–12. The lower enrollment numbers occur whenever it is deemed necessary to teach a course to a small number of Plant Pathology Graduate Students who request or need it at the time. Higher enrollment numbers occur in courses with broader appeal across disciplines (e.g., PPA 500) or that generally serve the needs both of Graduate Students and County Agents (e.g., PPA 640). Most of the courses have had at least occasional enrollment from students in other programs.

The Department of Plant Pathology is relatively small compared to Plant Pathology departments elsewhere (Appendix 11). Currently, in addition to the Chair, there are six Regular Title Series faculty members and four Extension Title Series faculty members, totaling 11 full time faculty members with no vacant lines. Over the long term (10 years) this represents a reduction of one faculty line, (approx. one research FTE). Also, in the past two years severe declines in extramural funding, largely due to reduced noncompetitive Federal funding, have resulted in reduced numbers of students and postdoctoral scholars. Nevertheless, scholarly output has held steady throughout the study period, and many of the published papers are in very highly ranked journals (Appendix 5). For example, two papers out of the Department were in *Nature Genetics*, which has 2-year and 5-year impact factors comparable to *Science* and *Nature*. Also, grant-application successes in FY2014 and early in FY2015 provide strong indications of a major upswing in competitive grant funding.

The department has identified, as its most important limitations, the lack of resources to support equipment upgrades and replacements, the low number of research FTE among its faculty, and very limited space available for its research needs. Almost all major equipment items in the department are more than 10 years old, and the dated technology and repair needs may erode faculty productivity and competitiveness for funds. One faculty line was lost with the recent budget cut, further eroding collaborative opportunities in an already small department. Faculty numbers and infrastructure are also under severe space constraints, so additional space would need to be identified to accommodate research labs and offices for the requested new faculty members and their personnel.

The Plant Pathology faculty has suggested enhancements to help keep the department competitive for funding and attractive for students. The suggestions are two new faculty lines, and an overhaul of major equipment with special emphasis on plant growth facilities. One of the faculty lines should focus on plant or fungal virology — areas of emphasis of a recently retired faculty member — to bring the virology group back to three members. The other faculty line should focus on plant bacteriology, an area of great importance in applied and extension plant pathology as well as research, but one that is not strongly represented among the current research faculty in the Department. Equipment needs include, but are not limited to, replacing the suite of growth chambers in the containment facility to allow for experiments involving highly contagious or exotic plant pathogens, which will facilitate emerging corporate and international research collaborations.

In summary, UK Plant Pathology is well known for its excellence in research and extension, with faculty members who take very seriously, and have shown great success, in all three land-grant missions of teaching, research and service. Like many departments, ours has limitations in infrastructure, funding opportunities, and the means to provide quality education. These limitations are exacerbated by the small size of the department as measured in number of faculty members. Therefore, increases in faculty lines and infrastructure enhancements of the department will be worthwhile investments to further strengthen this department.

Overview of Progress since Last Self-Study

The Plant Pathology Department Strategic Plan for 2009–2014 was constructed within the framework of the Strategic Plan of the College of Agriculture, Food and Environment (CAFE), which in turn was constructed within the framework of the University of Kentucky (UK) Strategic Plan. Below we list the goals of the CAFE strategic plan, followed by the relevant department rationale, objectives, strategies or key indicators, results, limitations and plans.

Goal 1: Prepare Students for Leading Roles in an Innovation-driven Economy and Global Society.

Rationale:
Graduate training in well-funded, dynamic, research and extension programs, allied with state-of-the-art and traditional class work concerning plant diseases, seems the surest guarantee of producing individuals ready for relevant leadership positions in society. By seeking to engage the best of students, the department strives to assure a talented cohort capable of serving in the vanguard of future plant protection scientists and practitioners.

Objectives:
Objective 1: To recruit and retain high caliber graduate students.

Objective 2: To provide high quality graduate education in plant pathology.

Strategies:
Objective 1: In general, the caliber of incoming graduate students is assessed based on the entirety of the application package, which includes a resume or CV, statement from the applicant, transcripts, scores on GRE tests (and TOEFL when relevant), and letters of recommendation. When feasible, we also try to interview the applicants. The Academic Program Committee makes decisions about admission. A decision to accept the applicant generally requires that a source of funding be identified, and that at least one member of the department's graduate faculty expresses interest in serving as that student's major advisor and research mentor. If the source of funding is an individual faculty grant, the applicant is informed that the grant principle investigator (PI) or co-PI is expected to be the major advisor. If the source of funding is to be a research assistantship (RA) or fellowship administered by the department, the accepted applicant has the option to spend the first semester or two in laboratory rotations (for which we have instituted the specific course number, PPA 700).

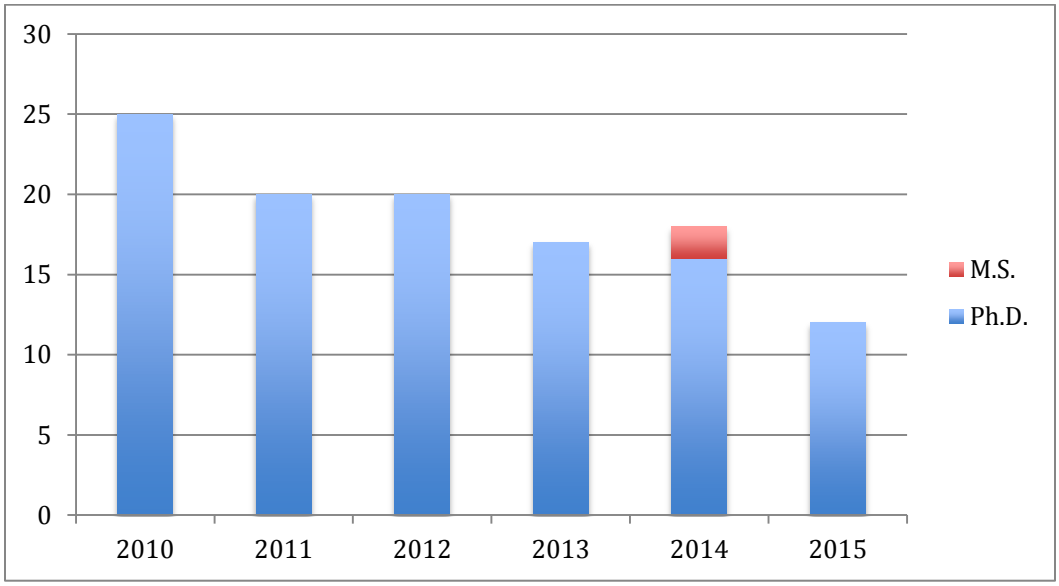
Objective 2: The department faculty and the Academic Program Committee regularly consider the effectiveness of the Plant Pathology curriculum and other educational and enrichment activities. The assessment devices (Appendix 7) have been refined during the past six years. Feedback, both to and from the student, is encouraged and also formalized in a number of ways: graded work in courses, annual progress reports produced jointly by the student and major advisor, annual advisory committee meetings, regular seminars presented by the student with evaluations from advisory committee members and other attendees, laboratory meetings and presentations, and qualifying (for Ph.D.) and exit examinations.

The Plant Pathology graduate courses are listed in Appendix 10. All core courses feature substantial writing components — and most feature oral presentations as well — in order to enhance the student's ability to communicate to the scientific community. This also fits well with the University of Kentucky Quality Enhancement Plan (http://www.uky.edu/UGE/pres-u) "to increase oral, written, and visual communication competence both inside and outside of the classroom." The M.S. and Ph.D. degree programs each require a research-based thesis. The department faculty members are all accomplished researchers, thus eminently qualified to direct thesis research. Publication of research findings in widely disseminated, peer-reviewed journals is expected, such that the thesis typically contains one or more chapters that have been, or are deemed likely to be scientific publications.

Results:
Objective 1: The number of graduate students enrolled in the program consistently exceeded our target of one per faculty FTE throughout the study period. Student numbers have ranged from 15–20.

Student Numbers

Year	Ph.D.	M.S.	Postdocs
2010	25	0	25
2011	20	0	21
2012	20	0	13
2013	17	0	9
2014	16	2	6
2015	12	0	7



In the most recent fall term, which has been typical, two students were on fellowships administered by the UK Graduate School, one on a Fulbright fellowship, and two on fellowships from their home countries (Egypt and Iraq). The majority of our students have been directed by research faculty (18 Ph.D.s awarded in 2009–2014), but we have also had notable success recruiting and educating students with an applied research interest who have had extension faculty as their major advisors or co-advisors (3 M.S. and 1 Ph.D. awarded in 2009–2015).

Objective 2: Although our selection process does not guarantee that all graduate students will succeed, the vast majority of our students complete their graduate degrees. We encourage our Ph.D. students to take their qualifying examination in their third year of our program. Those students who find that the program is not suitable for them generally leave well before then. The most common reasons for leaving our program are to address personal or family issues, or to enter a different program with a more applied emphasis. Of the 39 students enrolled between Fall 2009 and Spring 2015, 15 received Ph.D. degrees, 3 received M.S. degrees, 6 left the program, and 15 are currently enrolled. The one student who failed a Ph.D. qualifying exam ultimately wrote and successfully defended a research-based thesis to complete an M.S. degree.

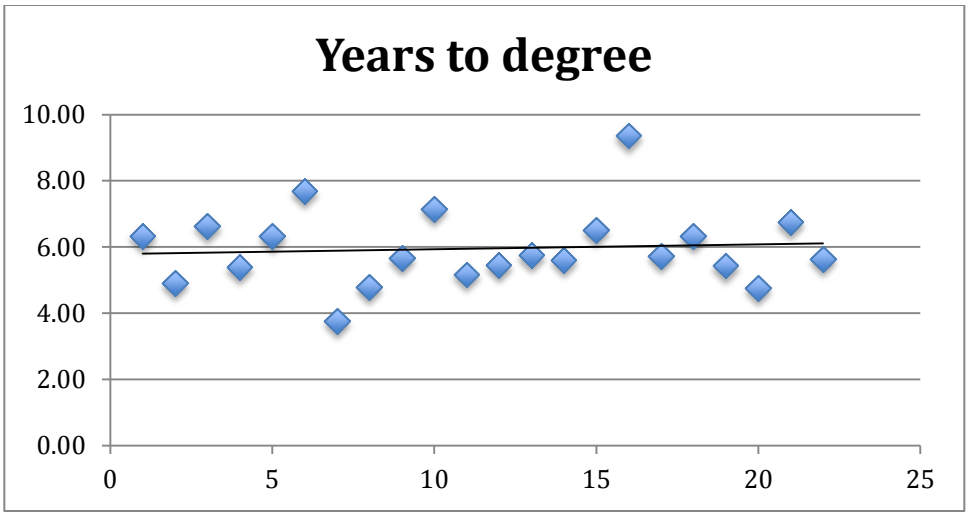
The retention rate, calculated as degrees awarded divided by the total number of

students who completed degrees or left the program, was 18/24 = 75% since Fall 2009. This is below but close to our goal of over 80%. We hope to improve our retention rate to exceed 80% in future by a combination of careful recruitment and presenting a welcoming atmosphere and rewarding experiences. Nevertheless, we also feel that, when recruiting or deciding on an applicant, other considerations sometimes trump the likelihood that the student will stay. In other words, some students are worth the risk, such as when they contribute to a diversity of societal and academic backgrounds that enriches the department as the academic and scientific community. In fact, if we are to continue to compete in recruitment with more famous universities, we need to be good at identifying those "diamonds in the rough." Evidence that we have been able to do so includes several students with lackluster GPA's and GRE scores (as well as students with excellent credentials) who have since been highly successful both in our program and in their subsequent careers.

Average time to the Ph.D. degree has held steady at 6.0 years over the study period.

Time to Degree (PhD)

Ph.D. Awarded	Start Date	Degree date	Difference (days)	Years to degree
Florea, Simona.	8/1/2003	12/2/2009	2315.00	6.34
Jiang, Yi	8/1/2004	6/25/2009	1789.00	4.90
Stork, Jozsef	5/1/2002	12/16/2008	2421.00	6.63
Xia, Ye	1/1/2005	5/18/2010	1963.00	5.37
Bec, Sladana	8/1/2005	11/29/2011	2311.00	6.33
Faulkner, Jerome R.	8/1/2003	4/5/2011	2804.00	7.68
Feliciano-Rivera, Merari	8/1/2007	5/4/2011	1372.00	3.76
Jeong, Rae-Dong	8/1/2006	5/12/2011	1745.00	4.78
Martin, Kathleen M.	8/1/2005	3/31/2011	2068.00	5.66
Pathak, Kunj B.	8/1/2004	9/23/2011	2609.00	7.14
Sharma, Monika	8/1/2006	9/29/2011	1885.00	5.16
Chanda, Bidisha	1/1/2007	6/12/2012	1989.00	5.45
Gao, Qing-Ming	8/1/2006	4/30/2012	2099.00	5.75
Mandal, Mihir K.	8/1/2006	3/12/2012	2050.00	5.61
El-Habbak, Mohamed H.	8/1/2006	2/4/2013	2379.00	6.51
Starnes, John H.	8/1/2004	12/13/2013	3421.00	9.37
Torres, Maria F.	8/1/2007	4/23/2013	2092.00	5.73
Li, Hua	8/1/2008	11/26/2014	2308.00	6.32
Anderson, Gavin L.F.	9/1/2008	2/7/2014	1985.00	5.43
Pan, Juan	8/1/2009	4/30/2014	1733.00	4.74
Xu, Kai	8/1/2007	4/30/2014	2464.00	6.75
Buiate, Ester	8/1/2009	3/23/2015	2060.00	5.64
AVERAGE				**5.96**



Of the three Ph.D. students who exceeded seven years, two started full-time jobs prior to writing their dissertations; one at the U.S. Department of Agriculture, and the other — the outlier at 9.4 years to degree — as a Somerset Community College instructor. Though we inform our students of the risks of taking employment before completing their dissertations (basically that it is difficult to expedite the writing), we also recognize that occasionally a student may need to take advantage of excellent career opportunity. When that has happened, we have worked with the student to complete the degree, which we consider far more important than a low time-to-degree statistic.

Additional: A major accomplishment was the implementation of a dual degree program with the Plant Pathology Department at the Universidade Federal de Viçosa (UFV), one of the two premier agricultural universities in Brazil (Appendix 8). This program will allow for PhD students in UFV to complete the requirements for a PhD in Plant Pathology at UK, and vice versa.

Limitations:
Maintenance of a vibrant graduate program requires a critical mass of faculty research FTE. The recent loss of a faculty position has reduced the Research FTE in the department by approximately 20% to its current value of 5.3. This affects both the time and the financial resources available for the graduate program. Currently our department has the lowest number of graduate students compared to self-reporting benchmark Plant Pathology departments, primarily due to the relatively low number of faculty.

Faculty Numbers

	Assistant Professor	Associate Professor	Professor	Total
University of Kentucky	1	2	6	9
Oklahoma State University	1	4	4	9
University of Arkansas	3	3	5	11
The Ohio State University	3	3	6	12

University of Nebraska-Lincoln	5	2	6	13
University of Minnesota	4	3	7	14
Purdue University	1	6	7	14
The Pennsylvania State University	4	4	7	15
Louisiana State University	3	2	10	15
University of Georgia	2	5	11	18
Cornell University	1	6	16	23

Additionally, in-state graduate tuition increased 30% over the past five years (Appendix 11), while departmental resources for graduate support remained essentially unchanged, with the result that fewer students could be supported. A recent increase in Research Challenge Trust Fund (RCTF) support helps to counteract the severe decline in tuition scholarships provided by the Graduate School (from approximately from five scholarships to one scholarship). Thus, funding students remains a challenge, and throughout the study period the Plant Pathology faculty have consistently felt that an increase in baseline stipends was impractical. However, current stipends may be having a negative effect on competitiveness of our program (Appendix 11), probably contributing to a low proportion of qualified domestic applicants, and perhaps also contributing to the recent loss of two excellent domestic students.

Plans:
1. The department will consider mechanisms to enhance recruitment and retention of high-quality students.

2. The Department will consider a modest increase in graduate student stipends to make the program more competitive with comparable programs in other universities. This should have a positive impact on retention, as well as on reducing the average time to degree by reducing incentive to start other jobs before completing the dissertation.

Goal 2: Promote Research and Creative Work to Increase the Intellectual, Social and Economic Capital of Kentucky and the World Beyond its Borders.

Rationale:
Highest quality research is an enduring departmental endeavor that has long been widely acknowledged. Testament to the department's distinction has come through national rankings of the program and the substantial, competitive, extramural grants received from federal sources. The Commonwealth is greatly advantaged by possessing a cohort of leading scientists addressing fundamental understandings of disease and parasitism in plants. Beyond the profound insights gained through basic pursuit of underlying principles, applied research activities address the needs of local growers—a responsibility the department holds high—so that timely and sound disease control strategies are developed for the benefit of Kentucky agriculture.

Objectives:
Objective 1: To comprehend, more completely, the complex interrelationships of plants and their pathogens and parasites.
Objective 2: To pursue applied research to provide state-of-the-art management recommendations for plant diseases in Kentucky.

Strategies:
An understanding of plant-pathogen/parasite interactions is key to developing strategies to minimize diseases of food, fiber and amenity plants, and to minimize food safety concerns such as mycotoxins in food and feed crops. The *raison d'être* for the Department of Plant Pathology is to address these issues through research, education and extension. This goal addresses the research side, and as with most research in the college, there is a conceptual but vague line between basic and applied research. In our department, Regular Title Series faculty members are responsible for most of the basic research, and Extension Title Series faculty members are responsible for most of the applied research. However, the traditions and structure of the Department, including the physical housing of all faculty members in the same office wing on the same floor of the Plant Science Building, encourages collaboration between Regular and Extension Title Series faculty members. Furthermore, the research projects undertaken by Regular Title Series faculty typically have at least long term, and often very near-term applied aims. This is partly as a consequence of informal interactions with Extension faculty members, formal interactions such as graduate student co-advising and service together on graduate advisory committees, expectations of funding agencies both state (Kentucky Science and Engineering Foundation; KSEF) and federal (particularly USDA-AFRI and NSF), research sponsored by companies, and joint international research and graduate education programs, such as with UFV and the Universidade Federal de Lavras (UFLA) in Brazil.

Basic research has long been a strength in the Department, and the fact that it continues to be strong is evidenced by the list of publications over the study period (Appendix 5), as well as the list of externally funded research projects (Appendix 12). The Department focuses on basic research in three areas, physiology (biochemistry and molecular biology) of plant disease and resistance, plant virology, and plant mycology. Each is currently the primary focus of two faculty members. (Additionally, the Chair maintains a small program in plant mycology and mycotoxins research.) Brief narratives of the seven basic research programs are included in Appendix 13.

The Plant Pathology Extension team uses a very wide variety of approaches to programming, which is driven in large part by our assessment (and the assessments of Extension Agents) as to which approaches will be most impactful for the diverse stakeholders we serve. Peer-reviewed extension publications remain a mainstay of our team (Appendix 14), as well as presentations at key local and regional meetings. Our use of social media (Twitter, Facebook, Pinterest, etc.) has grown very substantially in the past few years. Personalized agent trainings, involving local site visits, are often provided for new Agents.

Our diagnostic lab is a major centerpiece of our extension program, and it is very well received by stakeholders statewide. However, in addition to providing statewide service, our up-to-date diagnostic records serve as a basis for promulgating timely extension programming on diseases and their management.

The Extension team regularly uses Lync and other distance-learning technologies for program delivery. Agent trainings and updates are often provided via Lync. These seem consistently well received, because Agents are comfortable with the technology and it greatly reduces Agent travel. A small number of online programs are delivered to clientele each year, including pesticide applicator training. Some of these are successful; others are not as well received, which we think is less a problem with the technology than with stakeholder acceptance. We also note that, with a relatively new team of Extension Specialists (the four Extension faculty members), "face time" and first-hand field observations are critical to establishing a successful and respected extension program statewide.

Results:
Objective 1. Productivity of the department remained high and steady over the study period. Research funding trends from 2009-2014 are indicated in the chart below.

Direct Awards Five-Year Trend

2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
$1,684,587	$1,832,857	$1,657,913	$746,192	$534,800

The dramatic drop in awards for the last two fiscal years shown (2012–13 and 2013–14) is partly due to major decreases in noncompetitive awards, whereas no particular trend is apparent for Federal competitive awards (Appendix 12). Although the department briefly and slightly dropped below the target of $100,000 per Research FTE, a sharp increase in Federal competitive awards is expected in 2015–2016 based on initial successes in the first two months of the fiscal year. Appendix 12 also shows the indirect costs (F&A), which accrue as awards to the department are expended. No substantial change in F&A is evident over the same time period. The considerable research successes by the department are evident in the publication list over the study period (Appendix 5), the individual faculty curricula vitae (Appendix 15), and the consistent high ranking (most often top ranking) of the department among plant pathology and related departments nationally for research productivity (Appendix 5).

Objective 2. The Department has increased its number of Extension faculty members to its previous full complement of four, with three based in the Lexington campus, and one based in the UKREC, Princeton, Kentucky. The team covers extension activities and applied research, with each faculty member focusing on disease issues for a particular group of crops: Vincelli for forage and turf; Gauthier for fruits, ornamentals and woody plants; Pfeufer for vegetables and tobacco; and Bradley for grain crops. The rather impressive activities and accomplishments of the Extension faculty members listed above are summarized in their curricula vitae in Appendix 15. Three quarters of the faculty began their appointments recently: Nicole A. Gauthier (Ward) replacing John R.

Hartman (retired) in 2011; Emily E. Pfeufer replacing Kenneth W. Seebold (left for Valent U.S.A.) in 2015, and Carl A. Bradley replacing Donald E. Hershman (retired) in 2015. Because of the turnover, statistics vary over the study period, but we feel that those for 2011–2012 are indicative of the overall trends. Publications in typical venues for Extension faculty exceeded 10 per faculty FTE, including a group average of four refereed journal articles per year, which demonstrates consistent accomplishments in applied research. In addition to those publications, the team publishes timely newsletter articles (63 in 2011, 81 in 2012), mainly via Kentucky Pest News (KPN), a joint enterprise with the Entomology Department. Typically the Department Extension faculty collectively logs direct contacts exceeding 4,000 annually, and indirect contacts exceeding 10,000 annually. Also, the two Plant Disease Diagnosis Laboratories (PDLDL), located on the Lexington and Princeton campuses, consistently conduct a total of more than 4000 diagnoses annually.

Limitations:
The turmoil in private, state and federal financing over the study period has resulted in less available federal grant funding (both competitive and noncompetitive) and reductions in the College and University budgets that directly impacted the Department. The most dramatic manifestations of these financial limitations have been the loss of a faculty line, reduced availability of funds for equipment and infrastructure, and reduced numbers of tuition scholarships for graduate students.

The reduced number of faculty lines exacerbates the problems of a small department covering what is fundamentally a very broad discipline. Plant pathology can be likened to medicine, except that patients belong to many species, and “house calls” are typical. To be effective in the discipline requires deep understanding of plant biology, microbiology (viruses, bacteria, fungi, nematodes, etc.), and agroecology. Many of the applied and basic research projects are collaborative within the department, between departments, or both. Faculty members with different expertise must cooperate in training the next generation of scientists to the breadth and depth needed for their future careers and to help assure food security and food safety for the growing appetites of a growing human population.

Research in this discipline is also highly dependent upon some expensive infrastructure. The equipment items required at all levels of research are typically numerous and expensive, whether they be for high-throughput sequencing for molecular biology studies, confocal microscopes for ultrastructure studies, or planters and combines for field studies. Equipment maintenance and regular upgrades and replacements are necessary for all such major equipment. Space needs are also acute, and encompass wet laboratories, plant growth facilities, computer facilities and offices (Appendix 16). The UK Department of Plant Pathology made the decision when the Plant Science Building was designed over a decade ago that two containment suites were needed—one for microbial growth and one for plant growth and inoculations—to provide for safe research into pathogens that are exotic and/or especially dangerous to local crops. Currently, chambers in the plant growth facility are obsolete and unreliable, so that there is a general need for their replacement.

Greenhouse space (Appendix 16) is also at a premium, and is used heavily in all three missions of Research, Extension and Teaching. Currently the department is assigned 5887 sq. ft. of greenhouse space, but is in fact using 6743 sq. ft., including an 856 sp. ft. zone assigned to another department.

Plans:
The Department will request that the lost faculty line be replaced, and that an additional faculty line be added, in order to bring the department closer to a critical mass needed to cover the basic and applied research, extension and teaching needs of the discipline. In particular, one of the new faculty hires would emphasize plant and fungal virology, and the other would emphasize plant bacteriology. The recent retirement of Said A. Ghabrial has had particular impact, both reducing the department's traditional strength in virology, and removing the niche expertise Dr. Ghabrial provided in fungal viruses and their important roles in biological control of plant diseases. Furthermore, given the importance of bacterial diseases of plants (as well as bacterial symbiosis in biological protection and nitrogen fixation), the department needs basic research and teaching focused on plant bacteriology.

Much of the major equipment in the department will need replacement in the next six years. The department will request resources to do so. Among the most immediate needs is replacement of the aging growth chambers in the containment plant growth suite.

Goal 3: Develop the Human and Physical Resources of the University to Achieve the Institution's Top 20 Goals.

Rationale:
Recruitment and retention of intelligent, creative and energetic faculty members is the bedrock for success of any academic department. Talented faculty members aspire for the best of supporting staff and, in the sciences, gain the funds essential to support a high-caliber postdoctoral corps. Together, these individuals set the stage for a graduate student educational environment second to none. That the department has achieved such status is apparent through the numerous national and international honors and awards the Plant Pathology Department and faculty members have received over the years (Appendices 3, 4), through the capabilities of loyal and diligent staff, as well as through the numerous, able postdoctoral researchers populating the laboratories (see page 8).

Objectives:
Objective 1: To recruit and retain top-tier faculty.
Objective 2: To recruit and retain outstanding staff.
Objective 3: To recruit and retain superior postdoctoral scholars and visiting scientists.

Results:
Objective 1: In the last four biennial assessments, the Department of Plant Pathology at

UK has been ranked by Academic Analytics in the top four departments — three times as the top-ranked department — among 34 similar departments nationally, according to the scholarly productivity of the faculty (Appendix 5).

With considerable variance, the department has a strong overall record of competitive grant funding. Although competitive awards per research FTE dipped below the target of $100,000 in FY 2014, recent successes indicate that that target will be easily exceeded in FY 2015 and FY 2016. A good indicator of grant funding trends is the 'enrichment base,' which is the total F&A (indirect costs) obtained over the course of grant expenditures, for which data are available through FY 2014. For the Department these values have held between $225,000 and $250,000 from FY 2009–2014, with the exception of a large spike to $385,170 in FY 2011. In addition, Dr. Paul Vincelli received a Fulbright Scholar Award to Uruguay in 2005, a Fulbright Senior Specialist in Agriculture Award to Uruguay in 2013, and a Fulbright U.S. Scholar Award to Nicaragua in 2014.

Despite being very productive and highly ranked, and despite plans to increase faculty lines, the number of faculty lines has diminished from 12 to 11 due to a major budget cut. With two retirements (the former department chair, and a virologist who completed phased retirement) the number of faculty with primarily research appointments shrank from eight to six, and research FTE shrank from 6.0 to 5.3.

Faculty DOE and total FTE, 2015

Faculty Member	Instruction %	Research %	Service %	Administration %	Professional Development %
Bradley, Carl	0	0	100	0	0
Farman, Mark	18	82	0	0	0
Gauthier, Nicole	13	0	87	0	0
Goodin, Michael	20	58	10	5	13
Kachroo, Aardra	0	100	0	0	0
Kachroo, Pradeep	5	95	0	0	0
Nagy, Peter	5	95	0	0	0
Pfeufer, Emily	0	20	80	0	0
Schardl, Christopher	14	21	15	50	0
Vaillancourt, Lisa	15	65	5	15	0
Vincelli, Paul	17	0	78	0	5
Department Average	**9.73**	**48.73**	**34.09**	**6.36**	**1.64**
Full-Time Equivalent	**1.07**	**5.36**	**3.75**	**0.7**	**0.18**

However, the effect of this loss is more severe than this FTE reduction would imply, for

multiple reasons. One is that the breadth of the discipline is less adequately served, both in teaching and in research. Another is the decline in collaborative opportunities, which have always been a cornerstone of the department ethos. Reduced faculty numbers have also limited the department's ability to maintain a vibrant graduate program including recruitment, instruction and advisory functions.

Objective 2: Under budget constraints, and because the technical and office staff in Plant Pathology, as well as the plant disease diagnosticians, continue to be highly regarded both within and outside of the Department, the primary strategy has been to devote resources to retention efforts rather than expansion.

There has been very little turnover in technical staff over the past six years. One of the greenhouse managers, J. Douglas Brown, retired and was replaced by Sarah Holton, who had considerable prior training by Brown. Similarly, Paul Bacchi, the diagnostician based at UKREC in Princeton, KY, retired and was replaced by Brenda Kennedy, who had previously trained under Prof. Hershman and Paul Bacchi while employed in a soft-money position at the Plant Disease Diagnostic Laboratory (PDDL) in Princeton. Also, in recognition of the intensity of Plant Pathology Extension programming the College identified funding for an additional Extension Associate (EA) in Lexington (hired), and a second EA in Princeton (to be hired soon).

Two of five (now four) office staff positions experienced turnover: the department purchasing agent and the Staff Support Associate II (with approx. 50% responsibility to support the extension program). The total number of office staff was reduced from five to four, with the completion of phased retirement by Barbara Coughlin. Based in no small part on the quality of the office staff, the decision was made to use salary savings from this retirement to upgrade three staff positions, resulting in ≥15% salary increases, albeit with increased responsibilities. Later, Cheryl Kaiser was hired into the newly vacant Staff Support Associate II position. She was the ideal candidate because this position includes support of the extension program as a major responsibility, and Kaiser had previously worked in the department as a plant disease diagnostician and later as a part-time editor for *Kentucky Pest News*.

Objective 3: The quality of postdoctoral scholars and other temporary staff researchers is evident in the strong publication records of the department faculty (Appendix 5).

Recruitment of postdoctoral scholars is the responsibility of individual faculty members. The numbers of postdoctoral scholars (see page 14) and other Ph.D.-level research staff have declined due to several trends, not least the reduced research faculty FTE and the decline in noncompetitive funding in the Federal budget. The total number of Ph.D.'s other than faculty employed by the department has declined from 29 in 2010 to 12 in 2015.

Currently the department has seven postdoctoral scholars (see page 9). University regulations allow a maximum of six years appointment as a postdoctoral scholar. So, because the department has had low turnover of postdocs, several Ph.D.-level

researchers in the department now are employed under other titles.

The new postdoctoral position of Robert Louis ("Lou") Hirsch (Ph.D. in Plant Pathology, University of Arkansas) is unique in the Department because his primary responsibilities are teaching and outreach in PPA, ABT and Biology. His current support is 1/3 from CAFE and 2/3 from the College of Arts and Sciences (A&S). How his position evolves in the next 1–2 years depends on his career needs and expectations as well as those of CAFE and A&S, and on the availability of funding. Having such an individual in a PhD-level staff or faculty position could enhance the breadth and opportunities for education and outreach offered by the department, which in turn could enhance prospects for success in grant proposals, particularly to NSF, a major funding agency and one that strongly emphasizes broader impacts.

Visiting scientists are a common component of the Department, adding to expertise, breadth, diversity and productivity. Currently the Department has seven visiting scientists.

Limitations:
The two most important limitations to increasing faculty numbers are the lack of funds and limited space. Currently, no funds have been identified for the department to hire new faculty to replace one or both of the faculty members that recently retired.

Laboratory space is also at a premium. During the previous review there was anticipation that a new building devoted primarily to the USDA-ARS FAPRU group would facilitate decompression by allowing collaborating programs (such as Schardl's program on forage grass endophytes) and the genomics core ("AGTC") to move into the new building, thus freeing space that could be considered to house the programs of two new faculty hires. Because Federal funding for the FAPRU building was eliminated by Congress in 2011, that plan never materialized. However, some relief of the space shortage was realized by faculty member retirements. Whereas one of the retired faculty members (Smith) was full-time administrative (Department Chair), thus having no effect on laboratory space availability, the other retirement (Ghabrial) made a laboratory available to Aardra Kachroo, who previously lacked independent lab space. Recently, the AGTC moved from the Plant Science Building (PSB) to the Chandler Hospital, vacating space in PSB that we suggest could be considered as a laboratory for a new faculty hire in Plant Pathology.

Plans:
The department will request funds and laboratory space for two new faculty hires in the Regular Title Series. We propose to hire new faculty members with research emphasis that can similarly bridge and synergize with the current research and extension programs in the department.

One proposed new faculty line will be to develop a research program in plant or fungal virology that complements the existing plant virology, mycology and plant-pathogen interaction research in the department. Dr. Said Ghabrial, who recently retired, was

exceptionally positioned and capable of synergizing with other faculty in the Department and College. He had expertise in viral diseases of legumes, such as soybean, as well as in fungal viruses that contribute to biological control of diseases. In his legume virus research he formally collaborated both with Extension faculty (Hershman in Plant Pathology, and Johnson in Entomology) and with Research faculty (Aardra Kachroo). He also represented one of the elite but rapidly diminishing cadre of U.S. scientists working on virulence-diminishing viruses of plant-pathogenic fungi ("hypovirulence"). His retirement and near coincident retirements of Neil Van Alfen (University of California, Davis) and Donald Nuss (University of Maryland) open this promising area for new researchers with appropriate knowledge and expertise. Perhaps the highest profile use of such fungal viruses is in control of the chestnut blight pathogen (*Cryphonectria parasitica*), a major concern of the new Forest Health Research and Education Center (FHREC) that is now being formed on the UK campus in Lexington.

The second new faculty line will be for research emphasizing plant bacteriology or plant-bacterium interactions. Although some of the extension and research faculty in the department have backgrounds with plant-bacterium systems, none has a primary focus on such systems. Nevertheless, bacteria are a major plant-pathogen group. Bacteria are also used generally in plant pathology and other life sciences as a basic tool in molecular biology. Another indication of the importance of this area is the steady demand from students to take the plant bacteriology course.

Bacterial pathogens of plants are agricultural pests that pose risks of becoming more unpredictable under conditions consistent with climate change projections, specifically warmer temperatures, higher humidity, and an increase in extreme weather events. Some influential bacterial diseases affecting Kentucky crops are bacterial wilt of cucurbits (caused by *Erwinia tracheiphila*) and bacterial spot of solanaceous crops (caused by *Xanthomonas* species). In some areas of Kentucky, disease pressure from bacterial wilt makes organic production of cucurbits nearly impossible. Bacterial spot of solanaceous crops played a role in eliminating the sweet pepper processing industry in Kentucky in the mid-2000s.

The leading plant pathology professional society, the American Phytopathological Society, recently launched the Phytobiomes Initiative, which is aimed at profiling microbial communities on and in plants in order to improve crop safety, sustainability, and ultimately human health. Bacteria have important roles in the phytobiome not only as pathogens, but also as epiphytes, endophytes, rhizosphere inhabitants, and biofilm producers, and can also be dangerous contaminants of fruits and vegetables. Recent requests for applications by the USDA-NIFA have particularly focused on food safety, plant-microbe interactions, and climate variability, all of which closely tie into fundamental research on bacterial diseases of plants.

Goal 4: Promote Diversity and Inclusion.

Rationale:

The University of Kentucky (UK), College of Agriculture, Food and Environment (CAFE), and Department of Plant Pathology all recognize the importance of embracing and, to the extent that is practicable, reflecting the considerable diversity of the Commonwealth and the nation (http://www.uky.edu/DiversityPlan/diversity_plan.html). After all, the Department serves to address plant disease issues that are relevant to the livelihood and well-being of Kentuckians of different genders, walks of life, socioeconomic backgrounds, and ethnic origins. Furthermore, an international level of diversity is increasingly relevant in this age of global economy and global impacts of agricultural practices. We believe that efforts to promote diversity and inclusion, including recruitment of diverse students and members of the faculty and staff, will enhance the effectiveness of the department in all three missions of Extension, Teaching and Research.

Objectives:
Objective 1: To maintain gender/racial/cultural diversity in the student body.
Objective 2: To enhance gender/racial/cultural diversity in the faculty.
Objective 3: To enhance gender/racial/cultural diversity in the staff.

Results:
Objective 1:
The Department has maintained a graduate program with excellent international, ethnic and gender diversity. Applicants to our graduate program were primarily international, and the diversity of students reflects the diversity of applicants. In addition to several domestic students, graduate students in our program hailed from Brazil, Canada, China, Croatia, Colombia, Egypt, India, Indonesia, Iraq, Korea, Mexico and Romania.

Department of Plant Pathology 2009-2014 Enrollment Diversity

2013-2014 Enrollment (majors)*

	Total	Female	Male	Minority	African American
Master's	2	0	2	0	0
Doctoral	16	10	6	7	0
Post-Doc	8	2	6	2	0
Total	26	12	14	9	0

2012-2013 Enrollment (majors)

	Total	Female	Male	Minority	African American
Master's	0	0	0	0	0
Doctoral	17	10	7	0	0
Post-Doc	7	2	5	0	0
Total	24	12	12	0	0

2011-2012 Enrollment (majors)

	Total	Female	Male	Minority	African American
Master's	0	0	0	0	0
Doctoral	20	10	10	1	0
Post-Doc	18	7	11	1	0
Total	38	17	21	2	0

2010-2011 Enrollment (majors)

	Total	Female	Male	Minority	African American
Master's	0	0	0	0	0
Doctoral	20	11	9	3	1
Post-Doc	26	11	15	2	0
Total	46	22	24	5	1

2009-2010 Enrollment (majors)

	Total	Female	Male	Minority	African American
Master's	0	0	0	0	0
Doctoral	25	14	11	3	1
Post-doc	23	7	16	2	0
Total	48	21	27	5	1

* In 2013-2014, the University of Kentucky reporting system, formerly utilized by the College of Agriculture, Food and Environment to track enrollment diversity, was discontinued. The new reporting system calculated underrepresented (minority) groups in a different manner than the previous system.

For clarification, ethnic diversity is generally measured with respect to the total complement of U.S. citizens, so the significant contributions to diversity of international students and even some of the faculty members in our department are not reflected in the statistics. Also note that the number of minority students was correctly listed above for each academic year except for 2013-2014, during which none of the domestic students were of traditionally underrepresented minorities.

Of the seven domestic students enrolled during the 2009–2014 study period, two were African-Americans and two were Hispanic-Americans. One African-American male and one Hispanic-American female completed Ph.D. degrees, and one Hispanic-American female completed an M.S. degree. An African-American female left the program for financial reasons. Thus, over the study period, half of the domestic students receiving degrees in our program have been traditionally underserved minority students.

Gender diversity in the program continues to be good, with a slight majority of female students throughout the study period. The proportion of female students has held steady at 50-55%.

Objective 2: The Department faculty has steadily increased in diversity, particularly with

respect to gender. Three new faculty members were hired during the study period. Of these, two were female and one was male. These new hires have dramatically shifted the female representation among department faculty from 2/13, to 4/11 (36%). One of the several benefits to this shift is that faculty gender diversity increasingly reflects that of graduate students as well as technical and research staff. Another hoped-for consequence is a more distributed demand on female faculty to serve in college and university committees, as more women are available in our department to do so. Such pressure continues, however, on the sole African-North American (Jamaican/Canadian) member of our faculty.

The faculty of the department has considerable international character: one from England, one from Hungary, two from India, and one from Jamaica via Canada. Gender parity, but not racial or ethnic diversity, characterizes the six faculty members who grew up in the U.S.

Objective 3: The technical and office staff continue to show low diversity compared with other segments. The Department has experienced remarkably little staff turnover, and over the study period there have been new hires in only three out of 23 staff positions; one among the office staff and two among the technical staff. All of the searches were conducted through the University of Kentucky employment system, which encourages applications from minorities. All applicants deemed qualified were Caucasian females. Thus, we continue to experience less than the desired ability to attract qualified minority applicants.

Office staff — with turnover in one position — continues to be all white females. The technical staff has shifted from 9/15 to 12/16 female (from 60% to 75%), but without a change in ethnic diversity; two being Asian and the rest being white.

Limitations:
Despite the fact that, during the study period, there have been successes in recruitment of domestic minority students to the Plant Pathology graduate program, the current student body has no representation of traditionally underrepresented minorities. Such variation is unsurprising when the total number of domestic students tends to be only 2–4 at a time. Therefore, the challenge is not only to attract domestic minorities, but more generally to attract domestic applicants and retain domestic students in the program. Even so, our recent successes with minority students suggest that there is value in specifically encouraging their applications. Given constraints of time and focus of the faculty in the Department, institutional assistance is needed to help identify and implement appropriate recruitment efforts.

The level of retention of minority graduate students has been similar to that of domestic students, but the reasons given for leaving the program were more often financial in the cases of minority students. Considering that stipends in our program now fall below the benchmark median (Appendix 11), the uncompetitive funding level for our students appears to be a major limitation.

Recruitment of minorities to staff positions was identified as the greatest challenge in the previous Departmental Program Review, and continues to be a considerable challenge. Even gender diversity has been slightly eroded with staff turnovers. Priority must be to hire the most qualified applicants, and we depend heavily on the UK Employment Office to advertise. Thus, institutional assistance is also needed for minority (as well as male) recruitments for staff positions.

Plans:
The Department will consider mechanisms to enhance recruitment and retention of high-quality students in underrepresented groups. These efforts will entail discussions with college administration, particularly the Assistant Dean for Diversity.

The Department will seek mechanisms to increase financing of the student program to enable a substantial increase in student stipends preferably to exceed the benchmark median. This should also enhance recruitment and retention of minorities.

The Department will continue efforts to recruit high quality staff to fill any vacancies that arise. These efforts will include working with the UK Employment Office to encourage minorities to apply. Furthermore, the Department will continue to maintain an attitude and philosophy that embraces diversity.

Goal 5: Improve the Quality of Life of Kentuckians through Engagement, Outreach and Service.

Rationale:
Informing County Agents, farmers, agribusiness personnel, producers and homeowners about plant diseases and their appropriate management is of abiding economic and environmental benefit to the Commonwealth. Agent training activities, county meetings (both rural and urban), electronic documents and printed publications, as well as radio and television broadcasts and social media, all represent valid and valued routes to educate diverse audiences. Accurate plant disease diagnostic records allow careful monitoring of disease outbreaks and progress. Moreover, unanticipated disease scenarios can be promptly investigated. Insight gained about local and statewide problems allows assessment of probable economic consequences as well as providing a foundation for the implementation of optimal disease management practices, employed in as environmentally benign manners as practical. Moreover, future disease control strategies can be better mapped out.

Objectives:
Objective 1: To educate Kentucky's agricultural community and homeowners about plant diseases and their management.
Objective 2: To monitor and investigate plant diseases with respect to their impact on the resources and economy of Kentucky.
Objective 3: To provide, through the plant diagnostic laboratories, plant disease surveillance as well as real-time educational programming on plant disease activity and

distribution.

Results:
The Extension Plant Pathology team currently consists of four Extension Title Series faculty, two Plant Disease Diagnosis Laboratories (PDDL)—one on the Lexington campus and one on the Princeton UKREC campus—and an applied research laboratory on the Lexington campus. Based in Lexington are three of the Faculty and five Research or Extension Associates under their direction, including one Diagnostician and her Assistant. Based in Princeton is one Faculty Member and a Diagnostician, with plans for an additional Extension Associate to be hired and sited there.

The Extension team uses a very wide variety of approaches to programming, which is driven in large part by our assessment (and the assessments of Agents) as to which approaches will be most impactful for the diverse stakeholders we serve. Peer-reviewed Extension publications remain a mainstay of our team, as well as presentations at key local and regional meetings. Our use of social media (Twitter, Facebook, Pinterest, etc.) has grown very substantially in the past few years. Personalized agent trainings, involving local site visits, are often provided for new agents. The team's programming has consistently been well-received by Agents. Quantitative information in support of this is provided in the review scores from Extension agents, in Appendix 17.

The PDDL branches in Lexington and Princeton constitute a major centerpiece of the Plant Pathology Extension program, and their roles are highly appreciated by stakeholders statewide. However, in addition to providing statewide service, our up-to-date diagnostic records serve as a basis for promulgating timely extension programming on diseases and their management.

The Plant Pathology Extension team uses Lync and other distance-learning technologies regularly for program delivery. Agent trainings and updates are often provided via Lync. These seem consistently well received because Agents are comfortable with the technology and it greatly reduces Agent travel. A small number of online programs are delivered to clientele each year, including pesticide applicator training. Some of these are successful; others are not as well received, which we think is less a problem with the technology than with stakeholder acceptance. We also note that, with a relatively new team of Extension Specialists (faculty members), face-time and first-hand field observations are critical to establish a successful and respected Extension program.

The Plant Pathology Extension Team is Kentucky's primary participant in the Southern Plant Diagnostic Network (part of the National Plant Diagnostic Network). Our diagnostic laboratories help to provide real-time information on disease development, permitting us to provide timely extension programming. In turn, Agents use our diagnostic laboratories as resources to help develop their skills in recognizing important plant diseases, as well as to provide local programming on disease development. SPDN funding is absolutely critical to the daily operation of PDDL facilities.

Results:
The Extension Plant Pathology team has had the most changes and augmentation over the past six years. At the time of the previous review, an emeritus member of the Extension faculty was on part-time post-tenure appointment, pending replacement. That position was later filled, with a new Assistant Extension Professor, Nicole A. Gauthier (Ward), starting August 3, 2011. Since then, we have had turnover of two more positions, and both were filled by new hires: another Assistant Extension Professor, Emily E. Pfeufer, starting in Lexington on April 1, 2015, and an Extension Professor, Carl A. Bradley, starting in Princeton on July 1, 2015. The productivity of Dr. Gauthier since her hire, and the résumés and reputations of the two newer hires (Appendix 15), bode extremely well for continued high quality of the program. Associated with those new hires were two new Extension Associate positions (one recently filled for Lexington, the other in process for Princeton), which will further enhance the ability of these top-notch faculty members to effectively develop their extension, diagnosis and applied research programs.

Extension Plant Pathology has consistently exceeded the benchmarks laid out after the previous review (Appendix 1). Each year the number of plant disease diagnoses exceeded 4,000, for the Princeton and Lexington sites combined. Furthermore, annual direct contacts have averaged in the thousands, and annual indirect contacts have averaged in the tens of thousands, for each full-time Extension faculty member.

Selected recent publications from the Extension Plant Pathology team are listed in Appendix 14, in order to illustrate the breadth and types of publications employed by the team for delivery of important and timely information. Extension Plant Pathology typically averages more than 10 publications per year per faculty FTE, and approximately twice that number of newsletter reports. This team publishes the weekly/biweekly newsletter, *Kentucky Pest News* (KPN; https://kentuckypestnews.wordpress.com/about/), a joint venture with Extension Entomology, to which Plant Pathology contributes approximately 70 reports per year. The team has also been employing eXtension and YouTube as these technologies have become available.

Coursework: Three entirely online, synchronous course offerings were developed by Paul Vincelli primarily to contribute to professional development and graduate studies of County Extension Agents. Courses developed include the following (see Appendix 10 for descriptions):

- PPA 620: Fungicides, Advanced Concepts (3 credits)
- PPA 630: Introduction to Genetically Engineered Crops, Risks and Benefits I (1 credit)
- PPA 631: Introduction to Genetically Engineered Crops, Risks and Benefits II (1 credit)

Class delivery is via Adobe Connect or related technologies. Depending on class size, times of offerings are adjusted to fit schedules of students and instructor.

Online instruction has also been used selectively in PPA 400G, Principles of Plant Pathology (3 credits), in order to reduce Agent travel time, thereby making the course more accessible. Also, PPA 640, Identification of Plant Diseases, is now offered in a format more amenable to participation by Agents. The weekly laboratories are now scheduled as a total of six studio-type laboratories (plus the normal three field trips), which reduces the number of campus visits by Agents.

Limitations:
It is rare for the Extension program to receive substantial awards from commodity groups to help with expenses. Major expenses, for which adequate funds are typically difficult to identify, include in-state travel to extension events such as commodity group meetings, Master Gardener Training, etc., and replacement of old or outdated equipment in the diagnostic and extension laboratories. Likewise, database upgrades are needed for PDDL and required for integration with the National and Southern Plant Diagnosis Networks (NPDN and SPDN), but no source of funding for this has been identified.

Plans:
Recent new faculty hires have been linked to plans, and funds identified, for new and upgraded equipment in both the Lexington (PSB) and Princeton (UKREC) labs, as well as two new 3-year Extension Associate positions, one based in Lexington and the other in Princeton. Equipment upgrades are needed for the PDDL facilities at both locations.

The database used by PDDL must be overhauled both for in-house purposes and for integration with NPDN. Options being considered are either creation of an in-house system with assistance of the Ag Communications Department, or acquisition of the P-Clinic system used by several other states in the Southern region.

MAJOR AREAS OF CONCERN

- Small number of Regular Title Series faculty members, exacerbated by recent loss of one faculty line.
- Gaps in the curriculum because the number of faculty members is insufficient to teach courses in all relevant subdisciplines.
- Aging infrastructure, particularly equipment and plant growth facilities associated with research and diagnostic activities.
- Space limitations, particularly for accommodating new faculty hires.
- Low diversity of domestic applicants to the graduate program and of applicants for staff positions.

MAJOR RECOMMENDATIONS

- Create two new Regular Title Series tenure-track faculty lines in the department.
- Identify relevant laboratory space for the new faculty hires.
- Provide startup funds (estimated at $500,000–$600,000, currently) for the new faculty hires, including adequate funds for major equipment.
- Replace plant growth chambers with current, more efficient models, particularly in the containment suite.
- Avail institutional resources that have been implemented to help increase applications from traditionally underrepresented minorities.

Appendices

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Appendix 2	Implementation Plan 2014 Annual Report
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Appendix 1

Department of Plant Pathology

Strategic Plan

Appendix 1

Plant Pathology Department
Strategic Plan
2009-2014

Mission Statement: The mission of the department is to improve humankind's understanding of plant disease through research and, utilizing this knowledge base, to educate students and residents of Kentucky about plant diseases. By these means, the department serves to promote plant health throughout the Commonwealth and encourage the use of science-based, economically practical disease management practices which seek to minimize environmental consequences.

Goal 1: Prepare Students for Leading Roles in an Innovation-driven Economy and Global Society.

Preamble:
Graduate training in well-funded, dynamic, research and Extension programs, allied with state- of-the-art and traditional class work concerning plant diseases, seems the surest guarantee of producing individuals ready for relevant leadership positions in society. By seeking to engage the best of students, the department strives to assure a talented cohort capable of serving in the vanguard of future plant protection scientists and practitioners.

Objective 1: To recruit and retain high caliber graduate students.
Objective 2: To provide high quality graduate education in plant pathology.

Key Indicators:

- To maintain enrollment at no less than one graduate student per faculty FTE
- To maintain a retention rate of at least 80%.
- To maintain average-time-to-Ph.D. at less than six years.
- To maintain at least 20% of the student body on fellowship support. (N.B. Fellowships help attract and retain superior students, and the department will strive to maximize such funding amongst the student contingent.)

Significant Challenges:

- Base student funding is inadequate.
- Laboratory and office space is overtaxed.
- Both factors make the department less attractive for the best students.

Strategies:

- Aggressively pursue funding from diverse sources.
- Seek new space or reapportionment of existing space.

Goal 2: Promote Research and Creative Work to Increase the Intellectual, Social and Economic Capital of Kentucky and the World Beyond its Borders.

Preamble:
Highest quality research is an enduring departmental endeavor which has long been widely acknowledged. Testament to the department's distinction has come through national rankings of the program and the substantial, competitive, extramural grants received from federal sources over many years, in good times and bad. The Commonwealth is greatly advantaged by possessing a cohort of leading scientists addressing fundamental understandings of disease and parasitism in plants. Beyond the profound insights gained through basic pursuit of underlying principles, applied research activities address the needs of local growers -a responsibility the department holds high- so that timely, sound, disease control strategies are developed for the benefit of Kentucky agriculture.

Objective 1: To comprehend, more completely, the complex interrelationships of plants and their pathogens and parasites.
Objective 2: To pursue applied research to provide state-of-the-art management recommendations for problematic plant diseases in Kentucky.

Key Indicators:
- To maintain extramural funding at no less than $100,000 per year per research faculty FTE.
- To maintain refereed publications at no less than two per year per research faculty FTE.
- To maintain plant disease management publications at no less than two per year per Extension faculty FTE.
- To maintain a faculty scholarly productivity ranking in the top ten, nationally, for Plant Pathology programs.

Significant Challenges:
- Federal funding is highly competitive, with no necessary interest in issues of Kentucky concern.
- Laboratory, office, equipment and plant growth space is overtaxed.

Strategies:
- Aggressively pursue extramural research funding, locally, regionally and nationally from commodity-oriented, corporate, state and federal sources.
- Seek new space or reapportionment of existing space.

Goal 3: Develop the Human and Physical Resources of the University to Achieve the Institution's Top 20 Goals.

Preamble:
Recruitment and retention of an intellectually gifted, energetic faculty is the bedrock of any academic department set for success. This is the past, current and planned-for departmental fundamental. Talented faculty members aspire for the best of

supporting staff and, in the sciences, gain the funds essential to support a high-caliber postdoctoral corps. Together, these individuals set the stage for a graduate student educational environment second to none. That the department has achieved such status is apparent through the numerous national –even international- honors and awards the faculty has received over the years, through the capabilities of loyal and diligent staff as well as through the numerous, able postdoctoral researchers populating the laboratories.

Objective 1: To recruit and retain top-tier faculty.
Objective 2: To recruit and retain outstanding staff.
Objective 3: To recruit and retain superior postdoctoral scholar

Key Indicators:

- To increase faculty numbers from thirteen (2009; one in a part-time, post- retirement appointment and one in a reduced-time, phased retirement appointment) to fifteen (2014; all full-time).
- To aim for local, regional, national and international faculty professional achievement honors at no less than one per two years.
- To increase the total staffing level (clerical, technical, professional) by 15% by 2014.
- To maintain postdoctoral research scholar enrollment at no less than one per faculty FTE.

Significant Challenges:

- Identifying resources to ensure that faculty salaries and start-up support are nationally competitive.
- Federal funding to support postdoctoral researchers is highly competitive.
- Laboratory, office, equipment and plant growth space is overtaxed.
- Technical and professional staff with the requisite scientific training are in short supply in Kentucky.

Strategies:

- Maintain the department's strong standing in its field, nationally.
- Maintain the department's recognition on campus.
- Aggressively pursue extramural research funding locally, regionally and nationally from commodity-oriented, corporate, state and federal sources.
- Seek new space or reapportionment of existing space.
- Recruit from diverse sources.

Goal 4: Promote Diversity and Inclusion.

Preamble:
Diversity and inclusivity in the department represent one small step towards tolerance and understanding. The student, postdoctoral and faculty bodies are remarkably

culturally diverse, with the student complement also reasonably gender balanced. The staff, drawn more from the local population, is less diverse and majority female. The faculty is majority male. It is in minority racial participation - best represented amongst the student body (2009) - that change needs most to occur.

Objective 1: To maintain gender/racial/cultural diversity in the student body. Objective 2: To enhance gender/racial/cultural diversity in the faculty. Objective 3: To enhance gender/racial/cultural diversity in the staff.

Key Indicators:

- To maintain female enrollment in the graduate student cohort at no less than 35%
- To maintain enrollment of graduate students not traditionally represented in science at no less than 15%.
- To increase female faculty numbers by 50% by 2014.
- To seek to hire no less than two minority staff members by 2014.

Significant Challenges:

- Agriculture, at large, is not a disciplinary area with the cachet of such as medicine and law for minorities seeking professional advancement.
- Female faculty candidates remain in smaller numbers in applicant pools.
- Minority staff prospective hires with the requisite professional qualifications may prove difficult to identify.

Strategies:

- Irrespective of personnel category -student, faculty or staff- targeted recruitment endeavors will be engaged as a significant activity.
- Recruit from diverse sources.

Goal 5: Improve the Quality of Life of Kentuckians through Engagement, Outreach and Service.

Preamble:
Informing county agents, farmers, agribusiness personnel, producers and homeowners about plant diseases and their appropriate management is of abiding economic and environmental benefit to the Commonwealth. County agent training activities, county meetings (both rural and urban), electronic documents, written publications as well as radio and television broadcasts all represent valid and valued routes to educate diverse audiences. Accurate plant disease diagnostic records allow careful monitoring of disease outbreaks, and how they change. Moreover, unanticipated disease scenarios can be promptly investigated. Insight gained about local and statewide problems allows assessment of probable economic consequences as well as providing a foundation for the implementation of optimal disease management practices, employed in as environmentally benign manners as practical. Moreover, future disease control strategies can be mapped out. Such practices apply

to both natural disease events as well as those that might result from agricultural bioterrorism targeted at the Commonwealth's key plant industries.

Objective 1: To educate Kentucky's agricultural community and homeowners about plant diseases and their management.
Objective 2: To monitor and investigate plant diseases with respect to their impact on the resources and economy of Kentucky.
Objective 3: To provide, through the plant diagnostic laboratories, plant disease surveillance as well as real-time educational programming on plant disease activity and distribution.

Key Indicators:

- To maintain engagement/outreach/public service contacts at no less than 10,000 per year per Extension faculty FTE.
- To maintain plant disease diagnoses at no less than 2,500 per year.

Significant Challenges:

- Demand exceeds supply, in the sense of available faculty time.
- The first item is confounded (2009-2010) by a vacant faculty position, which is being partially covered through a reduced-time (40%), post-retirement appointee.
- Diagnostic space is limiting and not state-of-the-art.
- A secure funding base for diagnostic services does not exist.

Strategies:

- Faculty recruitment to four, full-time Extension FTE's will be the highest priority.
- By 2014, expansion to five, full-time Extension FTE's is the target.
- Seek more and higher quality, plant disease diagnostic space.
- Endeavor to identify a stable funding source(s) for diagnostic services.

Appendix 2

Implementation Plan

Annual Report 2014

Department of Plant Pathology
Implementation Plan
2014 Annual Report
(Implementation Plan submitted September, 2010)

1. Incoming chair to engage faculty in strategic discussions

Assessment method: Feedback during regular faculty meetings.

Results: Faculty meetings have been held a minimum of every 2 months, with minutes recorded, distributed to faculty, corrected as needed, and approved at each subsequent faculty meeting.

Analysis of results and reflection: Regular faculty meetings have opened the lines of communication significantly between the chair and faculty members. Faculty members have been very receptive to the regular meetings.

Ongoing improvement actions: The chair will continue to hold faculty meetings at least every two months and distribute the minutes to all faculty members.

2. More creative approach to management of departmental resources/ professional development

Assessment method: Discussion in faculty meetings, as necessary

Results: The department was successful in an internal (college) competition for funds ($100,000) for a major equipment item, which is also used by other departments in the college. The department matched with $19,000 to cover the full cost.

Some reassignment of space was undertaken in light of a recent retirement.

Analysis of results and reflection: Equipment replacement greatly helps the competitiveness of research programs. However, with increasing difficulty obtaining funding for new equipment, the department's research competitiveness could erode considerably. Currently, aging growth chambers are a concern.

A faculty retirement alleviated the pressure on laboratory space experienced by the department since the move to the Plant Sciences Building. However, should that position be replaced, space issues will again be a major concern.

Ongoing improvement actions: Efforts are needed, and should be coordinated with other departments, to obtain USDA, NSF or NIH funding for instrumentation. The chair will continue to bring such opportunities to the attention of faculty and

encourage and facilitate such submissions.

3. Increase faculty number from 13 to 15 by 2014

Assessment method: Assessment of full-time faculty FTE.

Results: There was no increase in faculty numbers due to the lack of funds.

Analysis of results and reflection: Shrinkage of the department over the past four years inevitably reduces our competitiveness for quality students and for funding. In addition, it is more difficult to teach a full complement of courses in the discipline, both because there are fewer faculty to teach them and because there often are insufficient numbers of students needing those courses. At times, when there are only one or two students who require a course, faculty undertake to provide the necessary instruction. But, this is an inefficient system.

Ongoing improvement actions: A strong case can be made for an increase of two faculty lines in Plant Pathology, with primary Research and secondary Teaching appointments.

4. Refill faculty vacancies as soon as possible

Assessment method: Length of time between position vacancy and position fulfillment.

Results: One Professor completed phased retirement in December, 2013; an Extension Professor located at the University of Kentucky Research and Education Center (UKREC) notified the college of intention to retire effective December 31, 2014; and one Associate Extension Professor located at the main campus in Lexington left for an industry job in May, 2014. A search was initiated in June for a replacement at UKREC, and another search was initiated in August, 2014 for the vacant Extension faculty position in Lexington. Insufficient funds were available to support replacing the regular-title faculty position.

Analysis of results and reflection: Searches are ongoing to fill the two extension title faculty positions in Plant Pathology. As for the regular title vacancy, no search can be conducted until sufficient funds are identified that can support that position. This is unfortunate because the department needs additional expertise in its traditional field of excellence, plant virology, as well as in plant bacteriology and nematology.

Ongoing improvement actions: The four Extension faculty positions are critical to serving the needs of Kentucky growers in dealing with plant disease issues. Every effort will be made to continue to maintain a complement of four Extension Specialists in Plant Pathology. Should funds become available to do so, the regular

title series position also should be filled.

5. Creative solutions for replacing limited state funding support

Assessment method: The chair and the business officer assess the department budget situation regularly (at least once per month), and submit a budget annually in a department faculty meeting.

Results: The department budget was balanced in FY 2013. In response to a college-wide call for funding proposals relevant to multistate projects, and after consulting with the department faculty at large, we requested $100,000 for a multipurpose molecular imager, and matched that with funds from our department and other departments that utilize the imager. This was a much-needed upgrade of departmental equipment.

Analysis of results and reflection: Expenditures by the department must be minimized due to diminishing funds available over the past several years. A major concern is equipment, much of which is becoming unreliable and obsolete. Federal programs to compete for equipment funds are highly restrictive in the number of proposals allowed per institution, and while the department competes internally to be allowed to submit such proposals, success is understandably rare. Internal options for equipment replacement or repair are very limited, though we were able this year to avail ourselves of federal formula funds for a major replacement. There are other equipment items that will similarly require replacement or repair in the near future.

Ongoing improvement actions: Further equipment replacements and upgrades will depend on availability of funds. Decisions to pursue funding will continue to be made by consultation with all department faculty.

6. Continue iterative process for modifying and improving graduate course requirements and offerings

Assessment method: Student competency is assessed by questionnaires filled out at advisory committee meetings, qualifying exams, seminars, and exit exams. Student evaluations provide guidance for improving courses.

Results: On a 5-point scale, graduate student performances had the following average ratings over a 3-year period: Seminars and committee meetings: 3.44; Qualifying exams: 3.05; Exit exam/defense 3.95.

Analysis of results and reflection: Seminars and committee meetings can occur before or after qualifying examinations in a student's program, so we expect the ratings of these to be similar. The lower qualifying exam ratings may reflect the fact that the tests generally address broader subject matter than do the seminars and committee meetings. Nevertheless, the department is striving to increase average

qualifying exam scores. The Exit exam/defense scores should generally be much higher than those of seminars, committee meetings and qualifying examinations, reflecting the expectation for increased competency as the student nears the end of his or her graduate program. In keeping with that expectation, Exit exam/defense scores were higher than other scores.

Ongoing improvement actions: For the purposes of the department teaching program, the current curriculum is considered appropriate, although the department has agreed that changing one of the required first-year courses from 2 to 3 credit hours would provide for more in-class discussion time to enhance the value of that course.

In addition to high expectations for performance in coursework, the students are encouraged to get as much experience as possible in advisory committee meetings and seminar presentations. Furthermore, they are encouraged to do practice qualifying examinations, though the instances of such practice exams have declined in the past year. Discussions among faculty about how to encourage practice exams have led to the consensus that advisors and advisory committees should encourage this, but it should not be mandatory.

The department is currently negotiating with the two premier agriculture universities in Brazil to establish dual degree programs, and a formal proposal is under consideration with the Universidade Federal de Viçosa for such a program. For this reason, there is ongoing discussion among the department faculty concerning any curriculum adjustments that may be necessary to facilitate the dual degree program. Nevertheless, and considering that the vast majority of students are not likely to be involved in such a dual degree (funding for such students will probably be very limited), the priority remains to optimize the curriculum for domestic and a wide range of international students, such as are currently enrolled.

7. Consider reforming the Ph.D. Qualifying Exam to make it a more effective experience

Assessment method: Student competency is assessed both on the basis of the proportion of Ph.D. students who pass the exam, and by questionnaires filled out at the qualifying exams.

Results: No students took qualifying exams in 2013, while four took the exam in the Spring of 2014. On a scale of 1-4, the average score for qualifying exams was 3.05.

Analysis of results and reflection: The current format and options to change that format were discussed at a department faculty meeting. No sentiment was expressed to change the format. The right and responsibility was reaffirmed for the Director of Graduate Studies (DGS) to add questions to the written portion of any qualifying exam in order to maintain balance and fairness. Furthermore, there is

always a desire for students to exhibit the highest possible levels of competency in qualifying examinations, and ways to better prepare the students are regularly a matter of discussion. The faculty generally considers practice examinations to be an excellent mechanism to familiarize the students with the process, thereby allowing them to better demonstrate their competency. Although past students have availed themselves of practice exams, most students do not. Nevertheless, faculty advisors generally place their students in situations similar to qualifying exams during weekly laboratory meetings.

Ongoing improvement actions: The department will continue to conduct questionnaires at qualifying exams (as well as committee meetings) in order to assess whether we are improving. Results will be reported in faculty meetings, and possible ways to improve student competencies ahead of the exams will continue to be considered and implemented as practicable.

8. Recruit more domestic graduate students and enhance quality

Assessment method: Student numbers, scores on evaluations in qualifying exams and seminars, number of students successfully completing qualifying examinations, and number of students successfully completing final examinations.

Results: In 2013-2014, one student successfully completed an M.S. and three students completed Ph.D. degrees. There was also the successful completion of three qualifying examinations, with no failures. The recruitment of five new graduate students to start in Fall 2014 yielded two domestic (US) students, two from Mexico, and one from China.

Analysis of results and reflection: Student numbers have dropped 17% in two years (from 18 to 16 in 2013, and to 15 in 2014) as a direct result of reduced funding levels from grants, increased tuition costs, and reduced availability of tuition scholarships (Dean's scholarships) from the Graduate School. Nevertheless, the Plant Pathology program continues to have a vibrant and diverse graduate class, which includes students from the US (2 students) and six other nations: Brazil (3), China (2), Egypt (2), Indonesia (1), Korea (2) and Mexico(2).

The department has had no difficulty getting high quality applicants, but the most important limiting factor in recruitment is identifying funds to support the students. It is very rare for students to accept offers without funding, and stipends plus tuition currently exceed $30,000 annually. All students enrolled in Fall 2013, and 14 of 15 students enrolled in Fall 2014, received full stipend and tuition support.

Ongoing improvement actions: Because funding is the critical factor in recruiting high quality graduate students, all of the faculty continue a high level of activity in seeking funds from federally competitive (USDA, DoE, NSF and NIH) and state (KSEF) programs, as well as foundations (e.g., Gates Foundation) and private

sources (e.g., Monsanto).

9. Improve graduate student and postdoctoral scholar professional development opportunities

Assessment method: Employment of students and postdocs after leaving the department.

Results: All students and postdocs who have left the department, with one possible exception, have found gainful employment in an area related to their training. The exception is an M.S. student who, after completing his degree, returned home to Iraq, where the current civil unrest probably interferes with employment prospects. Of the three completed Ph.D.s, two continued as postdocs in the department, and the third was immediately hired as a master brewer in New Brunswick, Canada.

Analysis of results and reflection: Plant pathology is a very broad discipline, encompassing plants of many families, microorganisms, and parasites, from scales ranging from epidemiological to molecular. Therefore, students and postdoctoral trainees have a wide range of employment options. The high level of department success in placing students and postdocs reflects a high degree of respect for our training programs.

Ongoing improvement actions: Graduate students are made aware of the "Preparing Future Faculty" and "College Teaching and Learning Certificate" programs administered by the University of Kentucky Graduate School, and the department funds tuition for students to take the relevant GS courses. In addition, the department has agreed to hire one of its former graduate students to teach the undergraduate course, PPA 400G, as well as the graduate course, PPA 640, during the Fall 2014, in order to enhance her eligibility for teaching positions.

10. Job classifications should accurately reflect duties and responsibilities

Assessment method: Review of job descriptions by chair.

Results: The job analysis questionnaires (JAQs) for all department staff have been reviewed by supervisors and the chair as part of a University-wide digitization program. Some adjustments were made by supervisors in consultation with their staff to better reflect job expectations, and were approved by the supervisors, staff members, and chair.

Analysis of results and reflection: Regular reviews of the JAQs shall be done annually around the time of staff evaluations.

Ongoing improvement actions: The chair will continue to monitor this recommendation.

Appendix 3

Awards and Honors

AWARDS AND HONORS

The following are awards and honors received by current faculty members since joining the University of Kentucky.

Mark L. Farman

- Basil O' Conner Starter Scholar, March of Dimes Birth Defects Foundation, 1998–2001
- Member, Rice Blast Policy Committee, 2001–present
- Member, International Wheat Blast Consortium, 2011–present
- Appointed Director, University of Kentucky Advanced Genetic Technologies Center, 2012–2015
- Appointed Outreach coordinator for Kentucky Biomedical Research Infrastructure Network, 2014–present. Entails development of bioinformatics infrastructure in the Commonwealth of Kentucky
- Appointed Associate Director, University of Kentucky Healthcare Genomics Center, July 2015–present

Nicole A. Gauthier

- Bright Idea Award, Southern Region IPM (Integrated Pest Management), 2014
- Southern Region American Society of Horticulture Science Blue Ribbon Extension Publication Award, Midwest Fruit Workers Working Group and University of Kentucky, 2014 (for Midwest Blueberry Production Guide)
- KASEP Outstanding New Extension Faculty, Kentucky Association of State Extension Professionals, 2015
- Southern Region American Society of Horticulture Science Blue Ribbon Extension Communication Award, Southern Nursery IPM Working Group, 2015

Michael M. Goodin

- Director of the University of Kentucky-Plant Science Biological Imaging Facility, University of Kentucky, 2008–present
- Co-Director of Undergraduate Studies, University of Kentucky Agricultural Biotechnology Program, 2009–present
- A Teacher Who Made A Difference Award, University of Kentucky College of Education, 2012
- University of Kentucky Undergraduate Council Member, Elected by College of Agriculture Faculty, 2012–2015
- Outstanding Teacher Award, University of Kentucky CAFE Student Council, 2014

Aardra P. Kachroo

- Young Women Investigator Travel Award, American Society of Plant Biologists, 2009
- Elected Positions: University of Kentucky Agriculture Faculty Council, Elected by CAFE faculty, 2015-2016

Pradeep Kachroo

- Faculty Futures Award, University of Kentucky, 2004
- Prestigious Paper Awards, University of Kentucky College of Agriculture, 2007, 2010, 2014
- Section Editor, BMC Plant Biology, 2009-present
- Special Editor, Current Opinion in Plant Biology issue on Host-pathogen interaction, 2013
- Co-Editor, Journal of Integrative Plant Biology, 2014 – present
- President, Host-Resistance Committee, American Phytopathological Society, 2012 - 2013
- Noel Keen Award for Research Excellence in Molecular Plant Pathology, American Phytopathological Society, 2014
- Editor, Journal of Integrative Plant Biology, 2015

Peter D. Nagy

- Science and Engineering Award from the Governor of Kentucky, 2002
- Faculty Futures Award, University of Kentucky, 2004
- Bobby Pass Excellence in Grantsmanship Award, 2006
- Thomas P. Cooper Research Award, University of Kentucky, 2007
- University Research Professor Award, University of Kentucky, 2007
- Ruth Allen Research Award, American Phytopathological Society, 2008
- Section Editor for PLoS Pathogens, 2011-present
- Bobby Pass Excellence in Grantsmanship Award, University of Kentucky, 2013

Christopher L. Schardl

- McKnight Foundation Individual Award for Research in Plant Biology, 1989–1992
- Thomas Poe Cooper Award for Research in Agriculture, University of Kentucky, 1999
- George Mitchell, Jr. Award for Outstanding Service to Graduate Students, Gamma Sigma Delta Kentucky Chapter, 2000
- University Research Professorship, University of Kentucky, 2000
- Harry E. Wheeler Chair in Plant Mycology, 2001–present
- Fellow of the American Phytopathological Society, Inducted 2003
- Honorable Order of Kentucky Colonels, Inducted 2003
- Fellow of the Mycological Society of America, Inducted 2004
- Senior Editor, Molecular Plant-Microbe Interactions, 2007–2009
- University of Kentucky President's Award for Diversity, 2008
- Executive Editor, Mycologia, 2014–present

Lisa J. Vaillancourt

- George E. Mitchell Jr. Outstanding Faculty Award, for outstanding service to graduate students, Gamma Sigma Delta, 2007
- Bobby Pass Excellence in Grantsmanship Award, University of Kentucky College of Agriculture, 2010

Paul Vincelli

- Master Teacher Award, Gamma Sigma Delta, Kentucky Chapter, 2004.
- Fulbright Scholar Award to Uruguay, 2005. The J. William Fulbright Foreign Scholarship Board.
- Excellence in Teaching Award, American Phytopathological Society, 2007.
- Provost's Distinguished Service Professorship, 2007.
- Outstanding Service to Extension Award, Kentucky Assoc. of Agricultural Agents, 2010.
- Great Teacher Award, University of Kentucky Alumni Association, 2011
- Provost's Award for Outstanding Teaching, University of Kentucky, 2011
- M. Whiteker Award for Excellence in Extension, UK College of Agriculture, 2012
- Fulbright Senior Specialist in Agriculture Award to Uruguay, 2013
- Fulbright U.S. Scholar Award to Nicaragua, 2014
- Elected Councilor at Large, American Phytopathological Society, 2015-2018

The following are examples of awards and honors that the new (2015) faculty members had received prior to joining the University of Kentucky.

Carl A. Bradley

- Myron and Muriel Johnsrud Excellence in Extension Award, Early Career, Presented at the 2004 NDSU College of Agriculture, Food Systems, and Natural Resources Awards Ceremony (2004)
- Excellence Award for Research, Presented by the North Dakota Dry Pea and Lentil Council (2006)
- Certificate of Outstanding and Dedicated Service, Presented by the Northarvest Bean Growers Association (2007)
- American Society of Agronomy, 2010 Educational Materials Awards Program, Certificate of Excellence, Newsletter Category – Presented to contributors of the Illinois Pest Management and Crop Development Bulletin (2010)
- List of Teachers at the University of Illinois Ranked as Excellent by their Students (for teaching PLPA 407, Fall 2011)
- University of Illinois College of ACES, Faculty Award for Excellence in Extension (2012)
- Wyffels Hybrids Award for Faculty Excellence (2013)

Emily E. Pfeufer

- Paul Hand Award for Graduate Student Teaching Achievement, The Pennsylvania State University College of Agricultural Sciences, 2014
- Invited to I.E. Melhus Graduate Student Symposium, American Phytopathological Society Annual Meeting in Austin, TX, 2013
- Travel award, Sahakian Family Endowment for Graduate Education in Agriculture, The Pennsylvania State University College of Agricultural Sciences, 2014

Appendix 4

Plant Pathology Ranking by Academic Analytics for Faculty Productivity

- Strategic Plan 2009-2014
  - PDF
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Strategic Plan Key Indicator Analysis

GOAL 1 - Prepare Students for Leadership in an Innovation-Driven Economy and Global Society

	Key Indicators By 2014 the College will have:	Data Source	2008-2009 Baseline	2009-2010 Progress Report	2010-2011 Progress Report	2011-2012 Progress Report	2012-2013 Progress Report	2013-2014 Progress Report
1.	Increased the first-to-second year in-college retention rate to 80 percent.	UK IE Page 3	74.8% (Most recent data Fall '07 to Fall '08)	72.8% (Fall '08 to Fall '09)	64.7% (Fall '09 to Fall '10)	69.6% (Fall '10 to Fall '11)	71.0% (Fall '11 to Fall '12)	84.8% (Fall '12 to Fall '13)
2.	Reduced the ratio of majors to teaching/advising faculty to less than 20/1 in each undergraduate program.	COA Chairs, UK IE	Majors-to-Teaching/Advising Faculty Ratios	Majors-to-Teaching/Advising Faculty Ratios	Majors-to-Teaching/Advising Faculty Ratios	Majors-to-Teaching/Advising Faculty Ratios	Majors-to-Teaching/Advising Faculty Ratios	Majors-to-Teaching/Advising Faculty Ratios
3.	Shifted enrollment growth to targeted, higher capacity majors in biological and environmental sciences: Five initial targets are Biosystems & Agricultural Engineering, Food Science, Forestry, Natural Resources & Conservation, and Plant & Soil Sciences.	UK IE	BAE (CIP 140301)=61; Food Science (CIP 011001)=14; FOR (CIP 030502)=52; NRC (CIP 030101)=63; PSS (CIP 011102)=63	BAE (CIP 140301)=64; Food Science (CIP 011001)=18; FOR (CIP 030502)=47; NRC (CIP 030101)=65; PSS (CIP 011102)=44	BAE (CIP 140301)=95; Food Science (CIP 011001)=26; FOR (CIP 030502)=59; NRC (CIP 030101)=78; PSS (CIP 011102)=41	BAE (CIP 140301)=108; Food Science (CIP 011001)=28; FOR (CIP 030502)=69; NRC (CIP 030101)=79; PSS (CIP 011102)=31	BAE (CIP 140301)=120; Food Science (CIP 011001)=34; FOR (CIP 030502)=74; NRC (CIP 030101)=88; PSS (CIP 011102)=43	BAE (CIP 140301)=144; Food Science (CIP 011001)=34; FOR (CIP 030502)=65; NRC (CIP 030101)=92; PSS (CIP 011102)=53
4.	Increased the number of graduate degrees awarded by an average of 5% per year.	UK IE	97 graduate degrees	85 graduate degrees	86 graduate degrees	105 graduate degrees	116 graduate degrees	95 graduate degrees

GOAL 2 - Promote Research and Creative Work to Increase the Intellectual, Social and Economic Capital of Kentucky and the World Beyond its Borders

	Key Indicators By 2014 the College will have:	Data Source	2008-2009 Baseline	2009-2010 Progress Report	2010-2011 Progress Report	2011-2012 Progress Report	2012-2013 Progress Report	2013-2014 Progress Report
1.	Increased the annual total of external awards to $35M or above.	UK OSPA Fiscal Year-to-Date Sponsored Projects Awards Totals Reports	$23,829,306	$34,221,048	$32,312,992	$22,105,234	$26,443,145	$31,713,353
2.	Increased federal competitive grant awards from 33 to 40 percent of the College's extramural funding portfolio.	COA Research Office	$8,016,401 or 33.64%	$11,620,468 or 33.95%	$12,472,231 or 39%	$9,155,187 or 41%	$10,120,562 or 38%	$13,702,138 or 43%
3.	Increased at the college level the number of refereed journal publications by 3% per year	COA Research Office-KAES Annual Reports	407	397	377	326	406	452
4.	Sustained the number of patents awarded on a four-year rolling average of five per year.	UK Commercialization & Economic Development	5.5	6	6	7.5	8.3	8.5

GOAL 3 - Develop the Human and Physical Resources of the College to Achieve Top 20 Stature

	Key Indicators By 2014 the College will have:	Data Source	2008-2009 Baseline	2009-2010 Progress Report	2010-2011 Progress Report	2011-2012 Progress Report	2012-2013 Progress Report	2013-2014 Progress Report
1.	Sustained at least two listings in the top 10 or	COA Assistant Dean for Academic	Fourth: Plant Pathology Program, Academic Analytics, Faculty	Fourth: Plant Pathology Program,	First: Plant Pathology Program,	First: Plant Pathology Program,	First: Plant Pathology Program,	First: Plant Pathology Program,

top quartile according to Academic Analytic's Faculty Productivity Index.	Administration	Scholarly Activity Index, 2007. Fifth: Plant Sciences, Academic Analytics, Faculty Scholarly Activity Index, 2007. Seventh: Plant Physiology, Academic Analytics, Faculty Scholarly Activity Index, 2007. Ninth: Entomology, Academic Analytics, Faculty Scholarly Activity Index, 2007. Tenth: Agricultural Sciences Research, Academic Analytics, Faculty Scholarly Activity Index, 2007	Academic Analytics, Faculty Scholarly Activity Index, 2010. Tenth: Plant Physiology, Academic Analytics, Faculty Scholarly Activity Index, 2010.	Academic Analytics, Faculty Scholarly Activity Index, 2011. 11th out of 43 programs, Entomology, Academic Analytics, Faculty Scholarly Activity Index, 2011.	Academic Analytics, Faculty Scholarly Activity Index, 2012. 11th out of 43 programs, Entomology, Academic Analytics, Faculty Scholarly Activity Index, 2012. 11th out of 35 programs, Plant Physiology, Academic Analytics, Faculty Scholarly Activity Index, 2012.	Academic Analytics, Faculty Scholarly Activity Index, 2012. 11th out of 43 programs, Entomology, Academic Analytics, Faculty Scholarly Activity Index, 2012. 11th out of 35 programs, Plant Physiology, Academic Analytics, Faculty Scholarly Activity Index, 2012.	Academic Analytics, Faculty Scholarly Activity Index, 2012. 11th out of 43 programs, Entomology, Academic Analytics, Faculty Scholarly Activity Index, 2012. 11th out of 35 programs, Plant Physiology, Academic Analytics, Faculty Scholarly Activity Index, 2012.
2. Increased the contributed value of the college endowment by $500,000 per year.	UK Controller and Treasurer Endowment Services, Sharon Klock. Marci Hicks, UK College of Agriculture Alumni and Development	$68,910,605	$70,727,002	$73,919,076	$74,573,870	$75,384,300	Data unavailable as of 10/31/2014
3. Sustained a Top 20 national ranking as indicated by NSF-reported research funding from USDA.	NSF	Ranked 15th in 2007 in USDA science and engineering research and development funding	Ranked 15th in 2007 in USDA science and engineering research and development funding	Ranked 15th in 2007 in USDA science and engineering research and development funding	Ranked 15th in 2007 in USDA science and engineering research and development funding	Ranked 15th in 2007 (the most current report) in USDA science and engineering research and development funding	Ranked 15th in 2007 (the most current report) in USDA science and engineering research and development funding
4. Renovated, modernized, or added 50,000 gross sq. ft. of educational, general, research, and student support space available for use by College of Agriculture faculty, staff, and students.	UK Budget Office, Laurie Sorg, Capital and Financial Analyst	2,433,104 total square footage in the COA	2,805,638 total square footage in the COA	2,630,016 total square footage in the COA	2,740,552 total square footage in the COA	2,649,574 total square footage in the CAFE	Data unavailable as of 10/31/2014

GOAL 4 - Promote Diversity and Inclusion

Key Indicators By 2014 the College will have:	Data Source	2008-2009 Baseline	2009-2010 Progress Report	2010-2011 Progress Report	2011-2012 Progress Report	2012-2013 Progress Report	2013-2014 Progress Report
1. Increased the percentage of enrolled undergraduate students from underrepresented groups from 9% in 2007 to 14% in 2014.	UK IE	9% in 2007-2008	11.75% in 2008-2009	12.2% in 2009-2010	12.2% in 2010-2011	12.4% in 2011-2012	16.6% in 2012-2013
2. Increased the percentage of enrolled graduate students from underrepresented groups from 7% in 2007 to 9% in 2014.	UK IE	7% in 2007-2008	7% in 2008-2009	8% in 2009-2010	7.5% in 2010-2011	6.5% in 2011-2012	8.0% in 2012-2013
3. Completed County Program/Civil Rights Reviews for each of 120 counties, including	Martha Thompson, College of Agriculture Extension Personnel Specialist	14	The 2009-2010 fiscal year was a scheduled planning year for	The second year of the reporting period was the first year of a four-year cycle of county program reviews. Ten county	The 2011-2012 fiscal year was the second year of a four-year cycle of county program reviews. Ten county review teams, made up of	The 2012-2013 fiscal year was the third year of a four-year cycle of county program reviews. Ten county review teams, comprised of an	The 2013-2014 fiscal year was the final year of a four-year cycle of county program reviews. Ten county review teams, comprised of an

Appendix 5

Publications 2009-2014

Appendix 5

Plant Pathology Publications 2009–2015*

Refereed Journal Articles:

1. Arnaoudova EG, Bowens PJ, Chui RG, Dinkins RD, Hesse U, Jaromczyk JW, Martin M, Maynard P, Moore N, Schardl CL (2009) Visualizing and sharing results in bioinformatics projects: GBrowse and GenBank exports. BMC Bioinformatics **10:** 2. doi A410.1186/1471-2105-10-s7-a4
2. Barajas D, Jiang Y, Nagy PD (2009) A unique role for the host ESCRT proteins in replication of tomato bushy stunt virus. PLOS Pathogens **5**. doi 10.1371/journal.ppat.1000705
3. Barajas D, Li ZH, Nagy PD (2009) The Nedd4-type Rsp5p ubiquitin ligase inhibits tombusvirus replication by regulating degradation of the p92 replication protein and decreasing the activity of the tombusvirus replicase. Journal of Virology **83:** 11751-11764. doi 10.1128/jvi.00789-09
4. Bryant MK, Schardl CL, Hesse U, Scott B (2009) Evolution of a subtilisin-like protease gene family in the grass endophytic fungus *Epichloe festucae*. BMC Evolutionary Biology **9:** 168 (113 pp.). doi doi:10.1186/1471-2148-9-168
5. Coleman JJ, Rounsley SD, Rodriguez-Carres M, Kuo A, Wasmann CC, Grimwood J, Schmutz J, Taga M, White GJ, Zhou SG, Schwartz DC, Freitag M, Ma LJ, Danchin EGJ, Henrissat B, Coutinho PM, Nelson DR, Straney D, Napoli CA, Barker BM, Gribskov M, Rep M, Kroken S, Molnar I, Rensing C, Kennell JC, Zamora J, Farman ML, Selker EU, Salamov A, Shapiro H, Pangilinan J, Lindquist E, Lamers C, Grigoriev IV, Geiser DM, Covert SF, Temporini E, VanEtten HD (2009) The genome of *Nectria haematococca*: contribution of supernumerary chromosomes to gene expansion. PLOS Genetics **5:** 14. doi 10.1371/journal.pgen.1000618
6. Florea S, Andreeva K, Machado C, Mirabito PM, Schardl CL (2009) Elimination of marker genes from transformed filamentous fungi by unselected transient transfection with a Cre-expressing plasmid. Fungal Genetics and Biology **46:** 721-730. doi 10.1016/j.fgb.2009.06.010
7. Fu DQ, Ghabrial S, Kachroo A (2009) GmRAR1 and GmSGT1 Are required for basal, R gene-mediated and systemic acquired resistance in soybean. Molecular Plant-Microbe Interactions **22:** 86-95. doi 10.1094/mpmi-22-1-0086
8. Ghabrial SA, Nibert ML (2009) Victorivirus, a new genus of fungal viruses in the family Totiviridae. Archives of Virology **154:** 373-379. doi 10.1007/s00705-008-0272-x
9. Hajimorad MR, Ghabrial SA, Roossinck MJ (2009) De novo emergence of a novel satellite RNA of cucumber mosaic virus following serial passages of the virus derived from RNA transcripts. Archives of Virology **154:** 137-140. doi 10.1007/s00705-008-0280-x
10. Iannone LJ, Cabral D, Schardl CL, Rossi MS (2009) Phylogenetic divergence, morphological and physiological differences distinguish a new

* Plant Pathology Graduate Student and Undergraduate Intern names are underlined.

Neotyphodium endophyte species in the grass *Bromus auleticus* from South America. Mycologia **101:** 340-351. doi: 10.3852/08-156

11. Jaag HM, Nagy PD (2009) Silencing of *Nicotiana benthamiana* Xrn4p exoribonuclease promotes tombusvirus RNA accumulation and recombination. Virology **386:** 344-352. doi 10.1016/j.virol.2009.01.015
12. Li ZH, Pogany J, Panavas T, Xu K, Esposito AM, Kinzy TG, Nagy PD (2009) Translation elongation factor 1A is a component of the tombusvirus replicase complex and affects the stability of the p33 replication co-factor. Virology **385:** 245-260. doi 10.1016/j.virol.2008.11.041
13. Liu HQ, Fu YP, Jiang DH, Li GQ, Xie J, Peng YL, Yi XH, Ghabrial SA (2009) A Novel Mycovirus That Is Related to the Human Pathogen Hepatitis E Virus and Rubi-Like Viruses. Journal of Virology **83:** 1981-1991. doi 10.1128/jvi.01897-08
14. Liu M, Panaccione DG, Schardl CL (2009) Phylogenetic analyses reveal monophyletic origin of the ergot alkaloid gene *dmaW* in fungi. Evolutionary Bioinformatics **5:** 15-30. doi 10.4137/ebo.s2633
15. Martin K, Kopperud K, Chakrabarty R, Banerjee R, Brooks R, Goodin MM (2009) Transient expression in *Nicotiana benthamiana* fluorescent marker lines provides enhanced definition of protein localization, movement and interactions in planta. Plant Journal **59:** 150-162. doi 10.1111/j.1365-313X.2009.03850.x
16. Nibert ML, Woods KM, Upton SJ, Ghabrial SA (2009) Cryspovirus: a new genus of protozoan viruses in the family Partitiviridae. Archives of Virology **154:** 1959-1965. doi 10.1007/s00705-009-0513-7
17. Pan JH, Dong LP, Lin L, Ochoa WF, Sinkovits RS, Havens WM, Nibert ML, Baker TS, Ghabrial SA, Tao YZJ (2009) Atomic structure reveals the unique capsid organization of a dsRNA virus. Proceedings of the National Academy of Sciences of the United States of America **106:** 4225-4230. doi 10.1073/pnas.0812071106
18. Pathak KB, Nagy PD (2009) Defective Interfering RNAs: Foes of Viruses and Friends of Virologists. Viruses-Basel **1:** 895-919. doi 10.3390/v1030895
19. Rehmeyer CJ, Li WX, Kusaba M, Farman ML (2009) The telomere-linked helicase (TLH) gene family in Magnaporthe oryzae: revised gene structure reveals a novel TLH-specific protein motif. Current Genetics **55:** 253-262. doi 10.1007/s00294-009-0240-3
20. Sasvari Z, Bach S, Blondel M, Nagy PD (2009) Inhibition of RNA recruitment and replication of an RNA virus by acridine derivatives with known anti-prion activities. PLOS One **4**. doi 10.1371/journal.pone.0007376
21. Venugopal SC, Jeong RD, Mandal MK, Zhu SF, Chandra-Shekara AC, Xia Y, Hersh M, Stromberg AJ, Navarre D, Kachroo A, Kachroo P (2009) Enhanced Disease Susceptibility 1 and salicylic acid act redundantly to regulate resistance gene-mediated signaling. PLOS Genetics **5:** 18. doi 10.1371/journal.pgen.1000545

22. Wang RYL, Stork J, Nagy PD (2009) A key role for heat shock protein 70 in the localization and insertion of tombusvirus replication proteins to intracellular membranes. Journal of Virology **83:** 3276-3287. doi 10.1128/jvi.02313-08
23. Wang RYL, Stork J, Pogany J, Nagy PD (2009) A temperature sensitive mutant of heat shock protein 70 reveals an essential role during the early steps of tombusvirus replication. Virology **394:** 28-38. doi 10.1016/j.virol.2009.08.003
24. Wu BD, Pogany J, Na H, Nicholson BL, Nagy PD, White KA (2009) A Discontinuous RNA Platform Mediates RNA Virus Replication: Building an Integrated Model for RNA-based Regulation of Viral Processes. PLOS Pathogens **5**. doi 10.1371/journal.ppat.1000323
25. Wu C, Kim Y-S, Smith KM, Li W, Hood HM, Staben C, Selker EU, Sachs MS, Farman ML (2009) Characterization of chromosome ends in the filamentous fungus *Neurospora crassa*. Genetics **181:** 1129-1145. doi 10.1534/genetics.107.084392
26. Xia Y, Gao Q-M, Yu K, Lapchyk L, Navarre D, Hildebrand D, Kachroo A, Kachroo P (2009) An intact cuticle in distal tissues is essential for the induction of systemic acquired resistance in plants. Cell Host & Microbe **5:** 151-165. doi 10.1016/j.chom.2009.01.001
27. Xia Y, Gao QM, Yu KS, Lapchyk L, Navarre D, Hildebrand D, Kachroo A, Kachroo P (2009) An Intact Cuticle in Distal Tissues Is Essential for the Induction of Systemic Acquired Resistance in Plants. Cell Host & Microbe **5:** 151-165. doi 10.1016/j.chom.2009.01.001
28. Young CA, Tapper BA, May K, Moon CD, Schardl CL, Scott B (2009) Indole-diterpene biosynthetic capability of epichloë endophytes as predicted by *ltm* gene analysis. Applied and Environmental Microbiology **75:** 2200-2211. doi 10.1128/AEM.00953-08
29. Zhang D-X, Nagabhyru P, Schardl CL (2009) Regulation of a chemical defense against herbivory produced by symbiotic fungi in grass plants. Plant Physiology **150:** 1072-1082. doi 10.1104/pp.109.138222
30. Zhang D-X, Stromberg AJ, Spiering MJ, Schardl CL (2009) Coregulated expression of loline alkaloid-biosynthesis genes in *Neotyphodium uncinatum* cultures. Fungal Genetics and Biology **46:** 517-530. doi 10.1016/j.fgb.2009.03.010
31. Arnaoudova E, Haws DC, Huggins P, Jaromczyk JW, Moore N, Schardl CL, Yoshida R (2010) Statistical phylogenetic tree analysis using differences of means. Frontiers in Neuroscience **4:** 47. doi: 10.3389/fnins.2010.00047
32. Bandyopadhyay A, Kopperud K, Anderson G, Martin K, Goodin M (2010) An integrated protein localization and interaction map for Potato yellow dwarf virus, type species of the genus *Nucleorhabdovirus*. Virology **402:** 61-71. doi 10.1016/j.virol.2010.03.013
33. Barajas D, Nagy PD (2010) Ubiquitination of tombusvirus p33 replication protein plays a role in virus replication and binding to the host Vps23p ESCRT protein. Virology **397:** 358-368. doi 10.1016/j.virol.2009.11.010

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35. de Sa PB, Havens WM, Ghabrial SA (2010) Characterization of a Novel Broad-Spectrum Antifungal Protein from Virus-Infected Helminthosporium (Cochliobolus) victoriae. Phytopathology **100:** 880-889. doi 10.1094/phyto-100-9-0880
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38. Harris D, Jaromczyk JW, Schardl CL (2010) Experimenting with database segmentation size vs time performance for mpiBLAST on an IBM HS21 blade cluster. BMC Bioinformatics **11:** P9. doi 10.1186/1471-2105-11-s4-p9
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40. Jaag HM, Pogany J, Nagy PD (2010) A Host Ca2+/Mn2+ Ion Pump Is a Factor in the Emergence of Viral RNA Recombinants. Cell Host & Microbe **7:** 74-81. doi 10.1016/j.chom.2009.12.009
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Functions Early in Resistance Gene-Mediated Defense Signaling in Arabidopsis and Tobacco. Plant Cell **22:** 918-936. doi 10.1105/tpc.109.071662

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54. Sasvari Z, Nagy PD (2010) Making of Viral Replication Organelles by Remodeling Interior Membranes. Viruses-Basel **2:** 2436-2442. doi 10.3390/v2112436
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Appendix 6

Ph.D. and M.S.

Post-Graduation Placement

Appendix 6

Ph.D. Alumni Placements

Craven, Kelly D.	PhD	2003	Postdoc, North Carolina State Univ., Raleigh, NC	Associate Professor, Noble Foundation, Ardmore, OK
Heist, Elmer P.	PhD	2003	Assistant Professor, Pikeville College of Osteopathic Medicine	Co-Owner, Ferm Solutions, Danville, KY
Blankenship, Jimmy D.	PhD	2004	Postdoc, University of Kentucky	PharmD Pharmacist, Harrison Memorial Hospital, Cynthiana, Kentucky
Machado, Caroline	PhD	2004	Postdoc, University of Kentucky	Lecturer in Biology, Indiana University Southeast
Panaviene, Zivile Sliesaraviciute	PhD	2004		Senior Scientist at ENVERA (Philadelphia)
Rajendran, Kottampatty S.	PhD	2004		Staff member, Broad Institute, Harvard
Cheng, Chi-Ping	PhD	2005		Associate Professor, Tzu-Chi University, Hualien, Taiwan
Flowers (Doyle), Jennifer	PhD	2005	Indiana Southern University, Lecturer	Spaulding University, tenured Associate Professor of Biology
Zhang, Chunquan	PhD	2005	Postdoctoral Associate, Plant Pathology Dept, Iowa State University, Ames, IA	Assistant Professor, Center for Biotechnology and Genomics, Alcorn State University, Natchez, MS
Gu, Hangcang	PhD	2006	Postdoctoral fellow, Harvard Medical School	Research scientist, Harvard Department of Stem Cell & Regenerative Biology- Broad Institute of MIT and Harvard
Shapka, Natasha	PhD	2006	deceased	deceased
Venard, Claire	PhD	2006	Postdoctoral Researcher in the Department of Entomology, University of Kentucky	Agriculture Research Specialist, Department of Plant and Soil Science, University of Kentucky
Venugopal, Srivathsa	PhD	2008	Scientist, Metahelix Life Sciences, India	Scientist, Conversion Center Manager, Monsanto Inc., India
Zhang, Dongxiu	PhD	2008	Postdoc, University of Kentucky	Postdoc, University of Maryland

Florea, Simona	PhD	2009	Postdoc, University of Kentucky	Research Associate, University of Kentucky
Jiang, Yi	PhD	2009		Business manager, China
Stork, Jozsef	PhD	2009	Postdoc, University of Kentucky	Research Associate, University of Kentucky
Xia, Ye	PhD	2010	Postdoctoral Scholar, University of Kentucky	Assistant Professor, Ohio State University
Bec, Sladana	PhD	2011	Postdoctoral Researcher in the Department of Plant Pathology, University of Kentucky	Diagnostician, University of Florida Plant Disease Clinic
Faulkner, Jerome R.	PhD	2011	USDA Natural Resources Conservation Service, Lexington, KY	same
Feliciano-Rivera, Merari	PhD	2011	Assistant Professor, University of Puerto Rico, Mayaguez	same
Jeong, Rae-Dong	PhD	2011	Animal and Plant Quarantine Agency, Korea	Group Leader Korean Atomic Energy Research Institute, Korea
Martin, Kathleen M.	PhD	2011	Postdoc, Kansas State University	Postdoc, Kansas State University
Pathak, Kunj B.	PhD	2011	Postdoc, University of Virginia	Postdoc, University of Virginia
Sharma, Monika	PhD	2011	Postdoc, University of Virginia	Postdoc, University of Virginia
Chanda, Bidisha	PhD	2012	Postdoctoral Researcher, Virginia Tech	Postdoctoral Researcher, Virginia Tech
Gao, Qingming	PhD	2012	Postdoctoral Scholar, University of Kentucky	Postdoc, USDA-ARS, Fargo ND
Mandal, Mihir	PhD	2012	Postdoctr, Virginia Tech. Univ.	Postdoctoral Researcher, Virginia Tech
El-Habbak, Mohamed	PhD	2013	Postdoctoral Research Associate, Plant Pathology Department, University of Kentucky.	Lecturer, Faculty of Agriculture, Benha University, Benha, Egypt.
Starnes, John H.	PhD	2013	Assistant Professor, Somerset Community College, Somerset, KY	same
Torres, Maria F.	PhD	2013	Postdoctoral Researcher at Cornell University Weill Medical College in Qatar	Postdoctoral Researcher at Cornell University Weill Medical College in Qatar

Anderson, Gavin L.F.	PhD	2014	Brewmaster, New Brunswick Canada	Brewmaster, New Brunswick Canada
Li, Hua	PhD	2014	Postdoctoral Research Associate, Department of Microbiology and Immunology, Northwestern University, Feinberg School of Medicine, Chicago, IL	Postdoc, University of Kentucky
Pan, Juan	PhD	2014	Postdoc, Pennsylvania State Univ.	same
Xu, Kai	PhD	2014	Postdoc, University of Kentucky	same
Buiate, Ester	PhD	2015	Relocated to Germany for personal reasons, looking for employment in her field.	Relocated to Germany for personal reasons, looking for employment in her field.

M.S. Alumni Placements

Flowers (Doyle), Jennifer	MS	2002	PhD Graduate Student, University of Kentucky	Spaulding University, tenured Associate Professor of Biology
Du, Meizhu	MS	2002	University of Georgia PhD program in Religious Studies	Unknown
Mundell, Jaclyn N.	MS	2005	Research Analyst, University of Kentucky	Clinical Nurse, University of Kentucky Children's Hospital
Bateman (Frazier), Amy	MS	2007	USDA small grains research lab, Aberdeen ID, research staff position	SAHM (by choice).
Holdcroft, Anna M.	MS	2013	Research Assistant IV, Cincinnati Children's Hospital Medical Center, Cincinnati, OH	Research Assistant IV, Cincinnati Children's Hospital Medical Center, Cincinnati, OH
Aljawasim, Baker D.G.	MS	2014	unknown	Unknown
Munir, Misbahkul	MS	2015	Plant Pathologist at Sembawa Research Centrer, Indonesion Rubber Research Institute, Palembang, South Sumatra, Indonesia.	Plant Pathologist at Sembawa Research Centrer, Indonesion Rubber Research Institute, Palembang, South Sumatra, Indonesia.

Appendix 7

Student Learning Assessment

Appendix 7

DEPARTMENT OF PLANT PATHOLOGY
GRADUATE PROGRAM ASSESSMENT PLAN

1. Introduction

This is the assessment plan for the Ph.D. and M.S. graduate programs in the Department of Plant Pathology in the College of Agriculture.

1.1. Unit Mission Statement

The mission of the department is to improve humankind's understanding of plant disease through research and, utilizing this knowledge base, to educate students and residents of Kentucky about plant diseases. By these means, the department serves to promote plant health throughout the Commonwealth and encourage the use of science-based, economically practical disease management practices that seek to minimize environmental consequences.

1.2. Basic Assessment Approach

We use a variety of different assessments of graduate student performance, most based on a rating scale of 1 (poor); 2 (fair); 3 (good); 4 (very good); 5 (excellent). The assessments are done primarily by the major professor and by the advisory committee. Our world-class faculty members have high expectations that are in line with the professional expectations in our discipline, and their assessments reflect this. Data relevant to each assessment tool is collected every year and compiled by the program Director of Graduate Studies (DGS). Data collection is completed by the end of September so that analysis can be finished in time for the annual October 31 assessment deadline. Results of the analysis will be discussed by the Department of Plant Pathology Academic Program Committee in October or November of each year, and recommendations for improvements from that committee will be made to the full faculty at the December faculty meeting. These will be implemented immediately if they are approved by a majority vote.

2. Assessment Oversight, Resources

2.1. *College Learning Outcomes Assessment Coordinator*: Associate Dean for Instruction Dr. Larry Grabau.

2.2. *Unit Assessment Coordinator*: Current serving DGS (at present Dr. Lisa Vaillancourt). The DGS is assisted in the task of compiling data by Shirley Harris, staff associate in the Department of Plant Pathology.

3. Program-Level Learning Outcomes

3.1. Students will demonstrate technical mastery of the core information and principles of the discipline, including essential factual information, historical context, current literature and issues, practical applications, and professional ethics.

3.2. Students will demonstrate abilities to think critically, solve problems, work collaboratively, use technology (including information technology) effectively, and develop and carry out high quality, hypothesis driven research.

3.3. Students will demonstrate mastery of oral and written scientific communication.

4. Curriculum Map

A curriculum map is included in the attachments.

The faculty of the Department of Plant Pathology extensively revised our curriculum in the Spring of 2006 after significant discussion, with graduate student input, led to agreement that our previous curriculum was not evenly covering all of the important and necessary information related to our learning outcomes. Three new required courses were added to the curriculum at that time. PPA 500 (Physiology of Plant Health and Disease) was added to provide essential background information and context for our new students, who come with diverse backgrounds and varying degrees of academic preparation and experience. PPA 500 also provides an important introduction to the norms of written and oral scientific communication in our discipline. PPA 600 (Critical Methods in Plant-Microbe Interactions) was added to provide exposure to current literature and issues and to practical applications in our discipline. PPA 600 emphasizes critical thinking, and oral and written communication skills. PPA 641 (Plant Disease, Population Biology, and Biotechnology) familiarizes students with the fundamentals of pathogen population biology, as well as with current issues in plant biotechnology. This course also emphasizes critical thinking and written communication skills. These three courses joined three existing courses, PPA 640 (Plant Disease Diagnosis), PPA 400G (Principles of Plant Pathology), and PPA 770 (Plant Pathology Seminar), to form our revised Graduate Core Curriculum. PPA 640 and PPA 400G teach critical core information, historical context, and principles of the discipline, as well as providing practical exposure to field and laboratory research practices. PPA 770 provides instruction and practice in oral scientific communication. In 2007, we added another class to our core curriculum, to further address deficits that were perceived by both students and faculty. This class, listed as a special topics course (PPA 784), addresses important aspects of professionalism including professional ethics and best practices for research and scholarship. In addition to these core classes we require our students to enroll in at least two of the four advanced topic courses that we offer: PPA 650 (Fungal Biology); PPA 670 (Plant Bacteriology); PPA 671 (Advanced Plant Virology); or PPA 672 (Advanced Plant Disease Resistance). All of these advanced courses include written and/or oral assignments. These are selected by the students based on their chosen area of specialization within Plant Pathology.

5. Assessment Methods and Measures (Formative and Summative recommended)

5.1. *Direct Methods/Measures Preferred/Used at the Course and Program Levels*

M.S. and Ph.D. students are evaluated for their progress through the program and their performance in all learning outcomes annually by their major professors and by the members of their advisory committees (see forms 1 and 2, attached).

Mastery of learning outcome #3 is also assessed for each student who enrolls in the PPA 770 seminar course and/or presents a seminar (including an exit

seminar) during the assessment period, based on the average score for each student from their committee evaluation of that seminar (see form 3, attached).

M.S. students write a research thesis and conduct a thesis defense at its completion. The thesis defense also serves as a comprehensive examination of the required coursework. Technical mastery of the program learning outcomes is evaluated based on a quantitative assessment provided by each Advisory Committee member immediately after the exam (see attached form 4).

Ph.D. students sit for the Qualifying Examination after completion of their required coursework. The Academic Advisory Committee administers the Qualifying Examination, with oversight by the DGS to ensure an equitable experience for all students. The Qualifying Examination is a comprehensive written and oral test of the student's capabilities and achievements relevant to all learning outcomes. The written exam takes one week to complete. The oral examination follows the written and generally lasts about 3 hours. Students pass both parts of the exam on a majority opinion of their committee. The DGS breaks a tie, if necessary. Technical mastery of the program learning outcomes is evaluated based on a quantitative assessment provided by each Advisory Committee member (see attached form 5). The written and oral exams are evaluated separately.

Ph.D. students write and defend a research dissertation. The defense includes a public oral presentation of the research findings. The dissertation defense provides a final opportunity to evaluate the student's performance overall during their program and during the defense itself on each of the program learning outcomes by the major advisor and the advisory committee (see attached form 4).

5.2. *Indirect Methods/Measures Preferred/Used at the Course and Program Levels*
Student grade point averages (GPAs) are tracked by DGS.

6. Data Collection and Review

6.1. *When will data be collected for each outcome?*
Some of the data are collected at the time of outcome testing (e.g. during annual student academic committee meetings, or after the required student seminars) and some are collected once per year on a schedule (e.g. the annual student performance evaluation, due on June 30 of each year).

6.2. *How will data be collected for each outcome?*
The DGS will coordinate collection of these data. Assessment forms will be provided by the DGS to the major professor or seminar coordinator, who will administer the evaluation and then return the completed forms to the DGS for data compilation. The DGS will obtain current GPA data for each student from the annual evaluation form (form 1).

6.3. *What will be the benchmark/target for each outcome?*

The benchmarks are both programmatic and individual. The programmatic benchmark is an average performance of all students on all outcome assessments of 3 or better (on a 5 point scale where 1 is poor and 5 is excellent). Other benchmarks include: All students maintaining an average GPA of 3.0 or greater; all students having an annual committee meeting; all students progressing achieving satisfactory yearly progress through their program goals (these latter two assessments come from form 1, attached). For individuals, the benchmark will be an average performance on all outcome assessments of 3 or better, and the target will be a consistent improvement in performance during progression through the degree program.

6.4. What *individuals/groups will be responsible for data collection?*
Data are collected by students themselves, the DGS, and the major advisors, and compiled by the DGS with the staff associate.

7. Assessment Cycle and Data Analysis

7.1 *Assessment Cycle [1-3 years]*
The University of Kentucky requires an annual assessment. However, given the time frame of five years for an average Ph.D. program, we would like to increase our assessment cycle to 3 years in order to obtain meaningful data. So far we have not been allowed to do this.

7.2 *Data Analysis Process/Procedures*
Data collection will be completed by September of each year so that analysis can be finished by the DGS and staff assistant in time for the annual October 31 assessment deadline. Results of the analysis will be shared with the Academic Program Committee in November of each year, and recommendations for improvements will be made by that committee and both the analysis and the suggested improvements will be presented to the full faculty at the January faculty meeting. Suggestions will be implemented immediately if they are approved by a majority vote.

7.3 *Data Analysis Report Process/Procedures [Unit report structure; College and Institutional report structure; Integration with Program Review; Integration with Strategic Planning process]*
Annual IAPs from Plant Pathology are sent, as required, to both the College Assessment Coordinator (CAC) and to the UK Office of Assessment (OA). The OA conducts a quality assessment of all IAPs at the campus level. The report on IAP quality is returned to the CAC who reviews that report, and may suggest adjustments before returning the report to the program. The DGS and departmental Academic Program Committee give all due consideration to the recommendations of the OA and CAC in their ongoing curriculum planning and assessment processes. During their periodic strategic planning and program review processes, the department examines the assessment data for indicators of student quality and achievement, and uses these data to inform the development of future strategies regarding the graduate program.

8. Teaching Effectiveness

8.1. *Identify measures of teaching effectiveness*

Teaching evaluations are administered online for all instructors of record for all courses. These are available to the Department Chairperson.

8.2. *What efforts to improve teaching effectiveness will be pursued based on these measures?*

If a faculty member consistently underperforms in their teaching evaluations, this is considered as part of their overall performance evaluation with the Department Chair, and the Department Chair may, at his discretion, refer the faculty member to available resources including the Center for the Enhancement of Learning and Teaching (CELT). It should be noted that our faculty generally perform at or above the college average, and some of our faculty have won prestigious college, university, and professional teaching awards.

9. What are the plans to evaluate students' post-graduate success?

Our field is very small and in the past, we kept up with our students somewhat informally through our professional contacts and via social media and meet-and-greets events at our annual professional meeting. We are still in touch with most of our graduates, even from 20 and 30 years ago, who have remained in the profession. HOWEVER, recognizing that the professional success of our graduates has now become a very important assessment metric for evaluating our program success, we plan to institute a more formal instrument for tracking our students.

We will develop an exit survey this fall for students leaving the program that will be administered prior to their departure. This survey will include a request for information about their professional plans and immediate plans for relocation, as well as questions about their perceptions of the quality of their education in our department. This survey will be repeated at one and five years after graduation. The same survey will be administered to students who are leaving the program without graduating, but we will not follow up with those students.

10. **Appendices –**Curriculum Map, Assessment Tools.

Appendix 7

Plant Pathology Graduate Program (M.S. and Ph.D.) Curriculum Map												
Program Learning Outcome	PPA400G	PPA500	PPA600	PPA640	PPA641	PPA650	PPA670	PPA671	PPA673	PPA770	PPA784	PPA794
Students will demonstrate technical mastery of the core information and principles of the discipline, including essential factual information, historical context, current literature and issues, practical applications, and professional ethics	X	X	X	X	X	X	X	X	X	X	X	
Students will demonstrate abilities to think critically, solve problems, work collaboratively, use technology (including information technology) effectively, and develop and carry out high quality, hypothesis driven research.		X	X	X	X	X	X	X	X	X	X	X
Students will demonstrate mastery of oral and written scientific communication.		X	X	X	X	X	X	X	X	X	X	X

Appendix 7

Plant Pathology
Annual Review of Progress of Graduate Students
(Due on or before June 30 each year)

General Information

Name: _____ Date of review: _____
Research area and/or thesis/dissertation title: _____
_____
Major Professor: _____ Minor area (if any): _____
Date of start of program: _____ Date of last Advisory Committee meeting: _____
Advisory Committee: _____ ; _____ ; _____ ;
_____ ; _____ ; _____

Summary of Activity

Summary of progress in required course work:

_____
_____
_____

Summary of progress in research:

_____
_____
_____
_____
_____

All courses taken since last review, and grades received:

_____
_____
_____

Cumulative GPA: _____

Qualifying Examination: ☐ Planned ☐ Passed ☐ Failed Date: _____

Publications/Abstracts/Posters/Presentations since last review (attach additional sheet, if necessary):

_____
_____
_____

Awards/Recognitions/Service since last review:

_____
_____
_____

Recommendations/Requirements/Censures (to be completed by Major Professor

_____
_____
_____

Signatures

_____ _____ _____
Student Major Professor Director of Graduate Studies

Appendix 7

Annual Graduate Student Evaluation: DUE BY JUNE 30
Plant Pathology **Date:**

NAME of Evaluator:

Major Professor? Y N

NAME of Student being evaluated:

Please circle the appropriate ranking for each of the following questions:

1. Rate the student's technical mastery of the core information and principles of the discipline, including essential factual information, historical context, current literature and issues, practical applications, and professional ethics:
   1 (Poor)
   2 (Fair)
   3 (Good)
   4 (Very Good)
   5 (Excellent)
   Comments:

2. Rate the ability of the student to think critically, solve problems, work collaboratively, use technology (including information technology) effectively, and develop and carry out high quality, hypothesis-driven research:
   1 (Poor)
   2 (Fair)
   3 (Good)
   4 (Very Good)
   5 (Excellent)
   Comments:

3. Rate the ability of the student to express him- or herself in oral and written form:
   1 (Poor)
   2 (Fair)
   3 (Good)
   4 (Very Good)
   5 (Excellent)
   Comments:

* Ideally this form will be filled out by the Major Professor and each Advisory Committee member at the annual Advisory Committee Meeting, and then attached to the Student Annual Performance Evaluation. If the timing of the committee meeting does not allow this, then the Major Professor should circulate the forms to the Advisory Committee and get them back prior to the June 30 deadline to attach to the Annual Performance Evaluation.

Appendix 7

Graduate Advisory Committee Evaluation of Student Seminar in Plant Pathology

Name of Student:

Name of Evaluator:

Date:

Please circle the appropriate ranking for each of the following questions:

1. Rate the student's technical mastery of the core information and principles of the discipline, including essential factual information, historical context, current literature and issues, practical applications, and professional ethics (as applicable), as demonstrated during the seminar and follow-up questions:

1. (Poor)
2. (Fair)
3. (Good)
4. (Very Good)
5. (Excellent)

Comments:

2. Rate the ability of the student to think critically and solve problems as demonstrated during the seminar and follow-up questions:

1. (Poor)
2. (Fair)
3. (Good)
4. (Very Good)
5. (Excellent)

Comments:

3. Rate the ability of the student to express him/herself orally and with presentation aids (slides, etc.), as demonstrated in this seminar and follow-up questions:

1. (Poor)
2. (Fair)
3. (Good)
4. (Very Good)
5. (Excellent)

Comments:

Students will need to be sure to inform the members of their Academic Advisory Committee about their seminars. The seminar coordinator will administer this form to the members of the Committee that are present at the seminar, and collect and compile the data.

Appendix 7

Dissertation or Thesis Defense Evaluation
Plant Pathology

NAME of Evaluator:

NAME of Student being Evaluated:

Please circle the appropriate ranking for each of the following questions:

1. Rate the student's technical mastery of the core information and principles of the discipline, including essential factual information, historical context, current literature and issues, practical applications, and professional ethics:
   1 (Poor)
   2 (Fair)
   3 (Good)
   4 (Very Good)
   5 (Excellent)
   Comments:

2. Rate the ability of the student to think critically, solve problems, work collaboratively, use technology (including information technology) effectively, and develop and carry out high quality, hypothesis-driven research:
   1 (Poor)
   2 (Fair)
   3 (Good)
   4 (Very Good)
   5 (Excellent)
   Comments:

3. Rate the ability of the student to express him- or herself in oral and written form:
   1 (Poor)
   2 (Fair)
   3 (Good)
   4 (Very Good)
   5 (Excellent)
   Comments:

Major Professor: Administer this form to all members of the examining committee (including yourself and the outside examiner) at the conclusion of the defense, and then return the completed forms to the Director of Graduate Studies.

Appendix 7

Evaluation for the Qualifying Examination
Plant Pathology

NAME of Evaluator:

NAME of Student being Evaluated:

Part of the Exam that is being Evaluated:

Written

Oral

Please circle the appropriate ranking for each of the following questions:

1. Rate the student's technical mastery of the core information and principles of the discipline, including essential factual information, historical context, current literature and issues, practical applications, and professional ethics (as applicable), as demonstrated in the written and oral qualifying examination:
   1 (Poor)
   2 (Fair)
   3 (Good)
   4 (Very Good)
   5 (Excellent)
   Comments:

2. Rate the ability of the student to think critically and solve problems, as demonstrated in the written and oral qualifying examination:
   1 (Poor)
   2 (Fair)
   3 (Good)
   4 (Very Good)
   5 (Excellent)
   Comments:

3. Rate the ability of the student to express him- or herself in written or oral form, as demonstrated in the written and oral qualifying examination respectively:
   1 (Poor)
   2 (Fair)
   3 (Good)
   4 (Very Good)
   5 (Excellent)
   Comments:

Appendix 8

University of Kentucky and Universidade Federal de Viçosa Dual Degree Program

Appendix 8

DUAL DOCTORAL DEGREE IN PLANT PATHOLOGY BETWEEN THE UNIVERSITY OF KENTUCKY AND THE UNIVERSIDADE FEDERAL DE VIÇOSA

Beginning in 2016, prospective students can apply to enter the dual Doctoral degree program, administered jointly by the Department of Plant Pathology at the University of Kentucky (UK) and the Departamento de Fitopatologia at the Universidade Federal de Viçosa (UFV) in Brazil (http://www.dfp.ufv.br/). Dual degree students will acquire academic credits and develop part of the research for their Doctoral dissertations at the partner university. A stay of at least 12 consecutive months at the partner university is required. Students who successfully complete this 4- to 5-year program will obtain Doctoral degrees in Plant Pathology from both UK and UFV. Students will develop language skills in English and Portuguese, and become familiar with norms of the discipline in both countries. Students will simultaneously fulfill the academic requirements of both institutions in order to obtain degrees from both. The goal is to prepare students to work across borders, in academic, government, or industry settings.

Requirements to Enter the Dual Degree Program:

- Basic requirements are the same as those for entry into the standard Ph.D. programs at UK and at UFV.
- Prospective students from Brazil will be required to obtain a passing grade on the TOEFL or IELTS tests. There is no language requirement for U.S. students wishing to participate in the program, although an ability to speak Spanish would be helpful.

Background

Diseases of plants cause significant crop losses worldwide. Many plant diseases are cosmopolitan in their distribution, and many others are introduced to new regions and initiate epidemics each year. Plant Pathology (the study and management of plant disease) is, consequently, a global activity, and graduate education in this discipline should promote the development of a workforce that is diverse and globally-engaged. Employees that can function effectively across borders are in demand by business, academia, and government agencies.

Brazil is a major agricultural producer and international supplier of agricultural commodities. It also represents a huge market for U.S. agricultural products and technology. Most of the major multinational agricultural corporations have significant presences in Brazil. Brazil has an active research community working in support of its agricultural enterprise. The state sponsored universities and research institutes are extremely well equipped and staffed with a highly educated workforce. Brazil is a geographically, culturally, and economically diverse country that offers a unique international experience for U.S. students. Educational exchanges are likely to be mutually beneficial for U.S. and Brazilian researchers, and to lead to faster progress in solving problems of mutual interest.

UFV (http://www.ufv.br/) was established in 1926 based on the U.S. land grant college model, and its educational system is similar to that of U.S. universities. Its first president was Dr. Peter Henry Rolfs, originally from the University of Florida, who established

UFV's long tradition of collaboration with international institutions. UFV has played a major role in the development of Brazilian agriculture. It has trained several generations of plant and agricultural scientists now working at other universities and at Embrapa, Brazil's largest agricultural research institution. UFV is consistently ranked as one of the top agricultural schools in Brazil. Furthermore, UFV provides a welcoming environment for international students: students from dozens of countries in North and South America, Europe, and Asia study there each year. The UK International Center recently selected UFV as one of only nine foreign universities worldwide, and the only one in the Western hemisphere, to be a key partner in future internationalization initiatives.

The Department of Plant Pathology (Departamento de Fitopatologia) at UFV consists of 18 faculty members engaged in a broad range of basic and applied research. The faculty has an excellent international reputation, and a collective research focus on disease management, particularly via sustainable methods e.g. biological control. Many of the faculty earned their Ph.D. degree at a U.S. or European university, and all participating faculty have research experience in the U.S. or Europe and speak English. The department is housed in a modern building on the UFV campus that is well equipped for all types of research.

The Department of Plant Pathology at UK has consistently been ranked among the top five departments for Plant Pathology research in the United States. The research faculty members are internationally known for their basic studies of the mechanisms of plant-microbe interactions, and they attract talented graduate students from all over the world. The outstanding extension faculty members are engaged mostly in applied disease management research that is focused on the needs of Kentucky growers, and some of them have extensive international experience in their own right.

These two strong departments complement one another very well in their respective strengths and resources. The dual degree student would be able to draw on the particular strengths of both in order to obtain a well-rounded education in Plant Pathology, as well as a working familiarity with a broad range of crops and diseases, and with both cultures and languages. We anticipate that graduates of this program would be highly competitive for jobs in both the U.S. and Brazil.

Curriculum

The recommended core curriculum for the dual degree program provides a rigorous and comprehensive education in both basic and applied Plant Pathology, with an emphasis on critical thinking, communication, and research methodologies.

Core Courses for the Dual Degree: 24-25 hours (PPA are courses at UK, FIP are courses at UFV).

Population Biology (1-3 credits) (PPA 641 (1 credit[1]) **OR[2]** FIP 680 (3 credits)

Disease Diagnosis (3 credits) (PPA 640)

Critical Research Methods (3 credits[3]) (PPA 600)

Physiology of Plant Health and Disease (3-4 credits) (FIP 701, **OR**[2] PPA 500 (3) **and** PPA 673 (1))

Mycology (3 credits) (FIP 610[4])

Bacteriology (3 credits) (FIP 640[4])

Virology (3 credits) (FIP 630[4])

Nematology (3 credits) (FIP 620)

Seminar (1 credit) (PPA 799)

A three-credit statistics course is a pre-requisite to the program, and can be taken concurrently.

An example of the program of coursework for a U.S. student entering the **dual degree** program with a B.S. in Plant Science or other relevant STEM discipline. Shaded boxes indicate time spent at UFV.

Yr:Semester	1:1	1:2	2:1	2:2[3]	3:1	3:2	4:1	4:2
Classes	PPA 400G[1]	PPA 600	PPA 640	FIP 630	FIP 610	QUALS	PPA 767[6]	PPA 767
	PPA 500	A&S 103[2]	PPA 641	FIP 640	FIP 620	PPA 767		
	PPA 794	PPA 794	PPA 673	PPA 794[4]	PPA 794			
		PPA 799	A&S 104[2]					
			PPA 794					
Total Graduate Credit	6	9	9	9[5]	9	2	2	2

1. If the student has taken a Plant Pathology course previously they will not need to take PPA 400G. PPA 400G does not count toward the total required credits for the PhD degree.
2. Portuguese levels 1 and 2. In addition to taking these courses, the students will improve their conversational abilities by engaging with their visiting Brazilian counterparts in the dual degree program.
3. The student will enroll in a noncredit six-week intensive Portuguese course upon arrival in Brazil in January.

4. PPA 794 is Dissertation Research. The student will receive credit for this course based on their independent research performed in the host laboratory. This research will be part of a collaborative project between the host laboratory and the student's home laboratory, and will comprise part of the student's dissertation.
5. Nine credits for the FIP courses will be transferred.
6. Post-qualifying research credit.

An example of the **dual degree** program of coursework for a Brazilian student entering with an M.S. degree is below[1]. Shaded boxes indicate time spent at UK.

Yr:Semester	1:1	1:2	2:1	2:2	3:1	3:2	4:1	4:2
Classes	FIP 701	FIP 630	FIP 610	PPA 600	PPA 640	QUALS	PPA 749	Research
	PPA 680	FIP 640	FIP 620	PPA 794	PPA 794	PPA 767		PPA 767
				Elective	PPA 799	Research		
Credit				9 UK credit	9 UK credit	2 UK credit	0 UK credit	2 UK credit

1. Students will be required to have completed a M.S. before beginning the dual degree Doctoral program, already a requirement for entry into the doctoral program there. This will substitute for one year of the required pre-qualifying residency for the UK degree. Prior to coming to UK students will need to achieve a score of 79 or higher on the TOEFL.

Appendix 9

PPA 395

Independent Study in Plant Pathology Contract

Appendix 9

PPA 395 Independent Study in Plant Pathology (1-4 Hours)

Research Contract

In order to receive credit for PPA 395, students and their research mentors must complete a contract. *If a contract is not completed and approved **each semester** by the add/drop date, you will be dropped from this class*. If a draft contract is *not* approved, we will contact you and/or your research mentor about necessary revisions.

Academic session in which the research will take place:
(Circle one) Fall Spring 4-week 8-week **YEAR:**_____

Research mentors may be any faculty member in the Department of Plant Pathology at the University of Kentucky. A list of faculty is available on the department web page (see http://www.ca.uky.edu/agcollege/plantpathology/people/index.html). Participants should be undergraduate students with good academic records.

Research mentors agree to provide lab space, resources (eg. chemicals), and guidance. Guidance includes safety training as well as training in scientific method, techniques, and presentations. Mentors will be asked to grade the student's independent work.

Please provide the following information:

Your name, email, and phone: _____
Your mentor's name, department, email, and phone: _____

Your signature: _____

Mentor's signature: _____

Your mentor must state here how you will be evaluated for a grade. Some examples are frequent personal conferences, diligence in the lab, group meetings, preparation of paper …, etc.

Dr. Christopher L. Schardl Approved: _____ Date:_____
SCHARDL@UKY.EDU.

Complete page 2 and submit it with this contract.

Description of the proposed research work: Prepare this description in consultation with your mentor. The description must include, in brief, (1) the hypothesis or aim underlying the project, (2) types of experiments or activities to be performed, (3) types of data to be taken, (4) types of data analysis, and (5) how the data relate to the hypothesis or aim of the project. You may attach an extra sheet if necessary.

Appendix 10

Graduate Study in Plant Pathology

http://www2.ca.uky.edu/agcollege/plantpathology/graduate/curriculum.htmlGraduate

Graduate Study in Plant Pathology

The Department of Plant Pathology at the University of Kentucky offers graduate study toward the Master of Science or the Doctor of Philosophy degree. Both our degree programs are research-oriented; we do not offer a non-thesis option.

Students can also take advantage of a new and exciting opportunity to simultaneously obtain Doctoral degrees in Plant Pathology from the University of Kentucky and from the Universidade Federal de Viçosa, in Brazil. This dual degree is the first of its kind for a Plant Pathology program in the United States, and it offers a unique bicultural educational experience to interested and highly motivated students.

Areas of Study

Graduate students are trained in plant-microbe interactions and related disciplines including biochemistry, ecology, evolution, genetics, genomics, and molecular biology. Our department has a particular strength in molecular and cytological studies of plant-microbe interactions.

Mentoring & Career Focus

The department promotes a tradition of close interaction among students, postdoctoral scholars, visiting scientists, staff specialists, and faculty. We maintain a high faculty-to-student ratio to ensure that every student receives individualized attention and support. Every student has a primary research mentor (the Major Professor) and an Advisory Committee devoted to helping the student reach her or his professional goals. We have an outstanding record of placing graduates in academia, biotechnological industries, agricultural Extension, and government and private research institutions.

PPA Plant Pathology

PPA 395 INDEPENDENT STUDY IN PLANT PATHOLOGY. (1-4)
Independent study in Plant Pathology under the supervision of a faculty member. Prereq: Consent of appropriate instructor.

PPA 400G PRINCIPLES OF PLANT PATHOLOGY. (3)
To present students with the principles of plant pathology. The causes, effects, control and nature of plant diseases will be studied; the laboratory will expose students to common diseases and pathogens discussed in lecture. Emphasis will be given to diseases important in Kentucky. Lecture, two hours; laboratory, two hours. Prereq: One semester of botany (e.g. BIO 351) and microbiology (e.g. BIO 108/109) or consent of instructor.

PPA 500 PHYSIOLOGY OF PLANT HEALTH AND DISEASE. (3)
First-semester graduate students and upper class undergraduates will gain a basic understanding of physiology, structure and development of plants and their associated fungi, viruses, bacteria and nematodes, and to appreciate how interactions with symbionts and pathogens influence plant health and disease. Prereq: PPA 400G (can be concurrent).

PPA 600 CRITICAL METHODS IN PLANT-MICROBE INTERACTIONS. (2)
The course will provide instruction on experimental methods commonly used in Plant-Microbe Interaction and will train students in critical thinking, grant writing, scientific ethics and seminar presentation. Prereq: PPA 500.

PPA 601 SPECIAL TOPICS IN MOLECULAR AND CELLULAR GENETICS. (1)
Each semester five distinguished scientists visit the UK campus to deliver a series of three formal lectures each and participate in numerous informal contacts with graduate students. The emphasis is on the presentation of the most current advances (often unpublished) in selected topics in molecular and cellular genetics. May be repeated to a maximum of six credits. (Same as BIO/BCH/MI/PLS 601.)

PPA 609 PLANT BIOCHEMISTRY. (3)
The course will consider the chemical constituents of plants (with emphasis on biologically or nutritionally significant compounds unique to plants), their biosynthesis, contribution to key metabolic and defense processes and the regulation of their synthesis. Included will be discussions of photosynthesis, carbohydrates, lipids, isoprenoids and phenylpropanoids, nitrogen fixation, nitrogen and sulfur reduction and assimilation, alkaloids and additional secondary compounds, frontiers in plant biochemistry. Prereq: BCH 607 or equivalent or consent of instructor. (Same as BCH/PLS 609.)

#PPA 620 FUNGICIDES, ADVANCED CONCEPTS. (3)
An in-depth exploration of diverse factors that affect field performance of fungicides, as well as environmental and toxicological dimensions of these disease-control chemicals. Prereq: Principles of Plant Pathology (PPA 400G) or the equivalent, or permission of the instructor.

PPA 640 IDENTIFICATION OF PLANT DISEASES. (3)
Recognition and identification of plant diseases and their causes and development. The course is designed to give students practical experience in dealing with a wide array of plant diseases, symptom expressions, causal agents and interactions with environmental factors encountered in the difficult task of identifying plant diseases. May be repeated to a maximum of nine credits. Lecture, one hour; laboratory, six hours. Prereq: PPA 400G or equivalent or consent of instructor. (Same as PLS 640.)

PPA 641 PLANT DISEASE, POPULATION BIOLOGY, AND BIOTECHNOLOGY. (1)
To understand implications of deployment of biotechnology and other disease management practices at the level of host and pathogen populations. Prereq: PPA 400G.

PPA 650 FUNGAL BIOLOGY. (3)
The Fungal Biology course introduces basic mycological concepts, including systematics, anatomy, cell biology, metabolism, developmental biology, ecology, population genetics, and reproduction. There is a focus on modern molecular approaches to these concepts. Students will also learn about the use of fungi in research and biotechnology. Prereq: Undergraduate courses in biology, genetics, and chemistry.

PPA 670 PLANT BACTERIOLOGY. (1)
Bacterial mechanisms underlying pathogenesis and virulence in interactions causing plant disease, and symbiotic compatibility in mutualisms. Prereq: PPA 400G, PPA 500, PPA 600, PPA 640 can be concurrent.

PPA Plant Pathology

PPA 671 ADVANCED PLANT VIROLOGY. (2)
Molecular basis of plant virus infection of plants. Virus replication and spread. Virus control strategies. Prereq: PPA 400G, PPA 500, PPA 600.

PPA 673 ADVANCED PLANT DISEASE RESISTANCE. (1)
Bacterial mechanisms underlying pathogenesis and virulence in interactions causing plant disease, and symbiotic compatibility in mutualisms. Prereq: PPA 400G, PPA 500, PPA 600.

PPA 700 PLANT PATHOLOGY LABORATORY VISITS. (1-3)
Semester-long rotations in Plant Pathology laboratories other than the students' "home lab". An opportunity will be provided to apply new approaches that are utilized in those labs to the students' research problems. May be repeated to a maximum of six credit hours.

PPA 748 MASTER'S THESIS RESEARCH. (0)
Half-time to full-time work on thesis. May be repeated to a maximum of six semesters. Prereq: All course work toward the degree must be completed.

PPA 749 DISSERTATION RESEARCH. (0)
Half-time to full-time work on dissertation. May be repeated to a maximum of six semesters. Prereq: Registration for two full-time semesters of 769 residence credit following the successful completion of the qualifying exams.

PPA 767 DISSERTATION RESIDENCY CREDIT. (2)
Residency credit for dissertation research after the qualifying examination. Students may register for this course in the semester of the qualifying examination. A minimum of two semesters are required as well as continuous enrollment (Fall and Spring) until the dissertation is completed and defended.

PPA 768 RESIDENCE CREDIT FOR THE MASTER'S DEGREE. (1-6)
May be repeated to a maximum of 12 hours.

PPA 769 RESIDENCE CREDIT FOR THE DOCTOR'S DEGREE. (0-12)
May be repeated indefinitely.

PPA 770 PLANT PATHOLOGY SEMINAR. (1)
Reports and discussion of problems and investigations of problems in plant pathology. May be repeated to a maximum of four credits.

PPA 784 SPECIAL PROBLEMS IN PLANT PATHOLOGY. (1-3)
May be repeated to a maximum of nine credits. Prereq: PPA 400G or equivalent or consent of instructor.

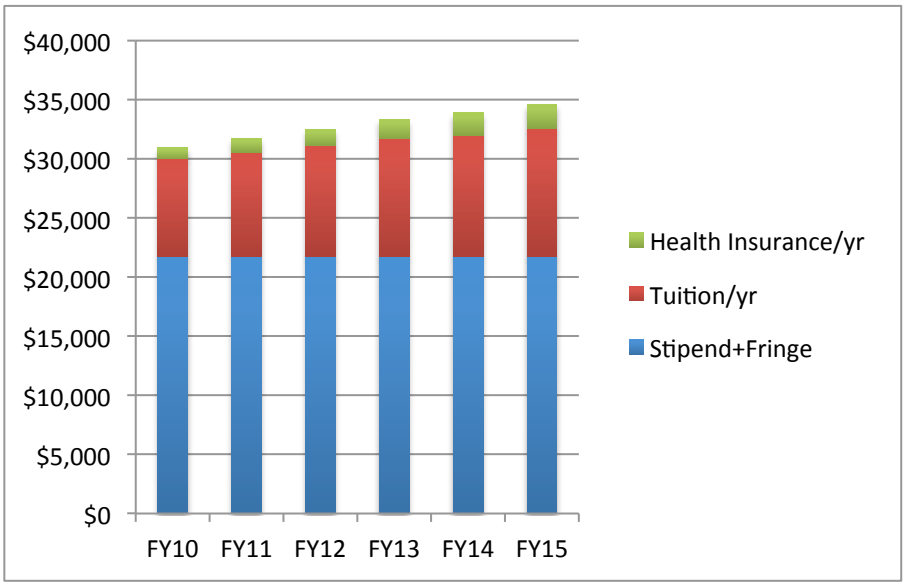
PPA 794 RESEARCH IN PLANT PATHOLOGY. (1-9)
May be repeated to a maximum of 30 credits. Prereq: PPA 400G or equivalent or consent of instructor.

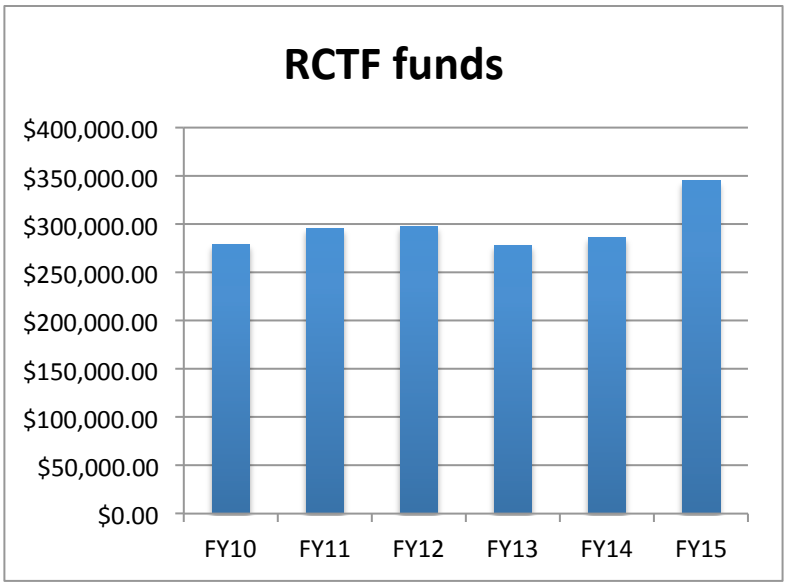
PPA 799 TEACHING IN PLANT PATHOLOGY. (1-2)
Discussion of, and experience with, various instructional techniques in plant pathology; effective preparation, presentation and evaluation of lectures and laboratories focusing on plant diseases; practical experience in lectures, teaching laboratories and/or mentoring undergraduate research projects. May be repeated to a maximum of four credits. Prereq: PPA 400G or equivalent.

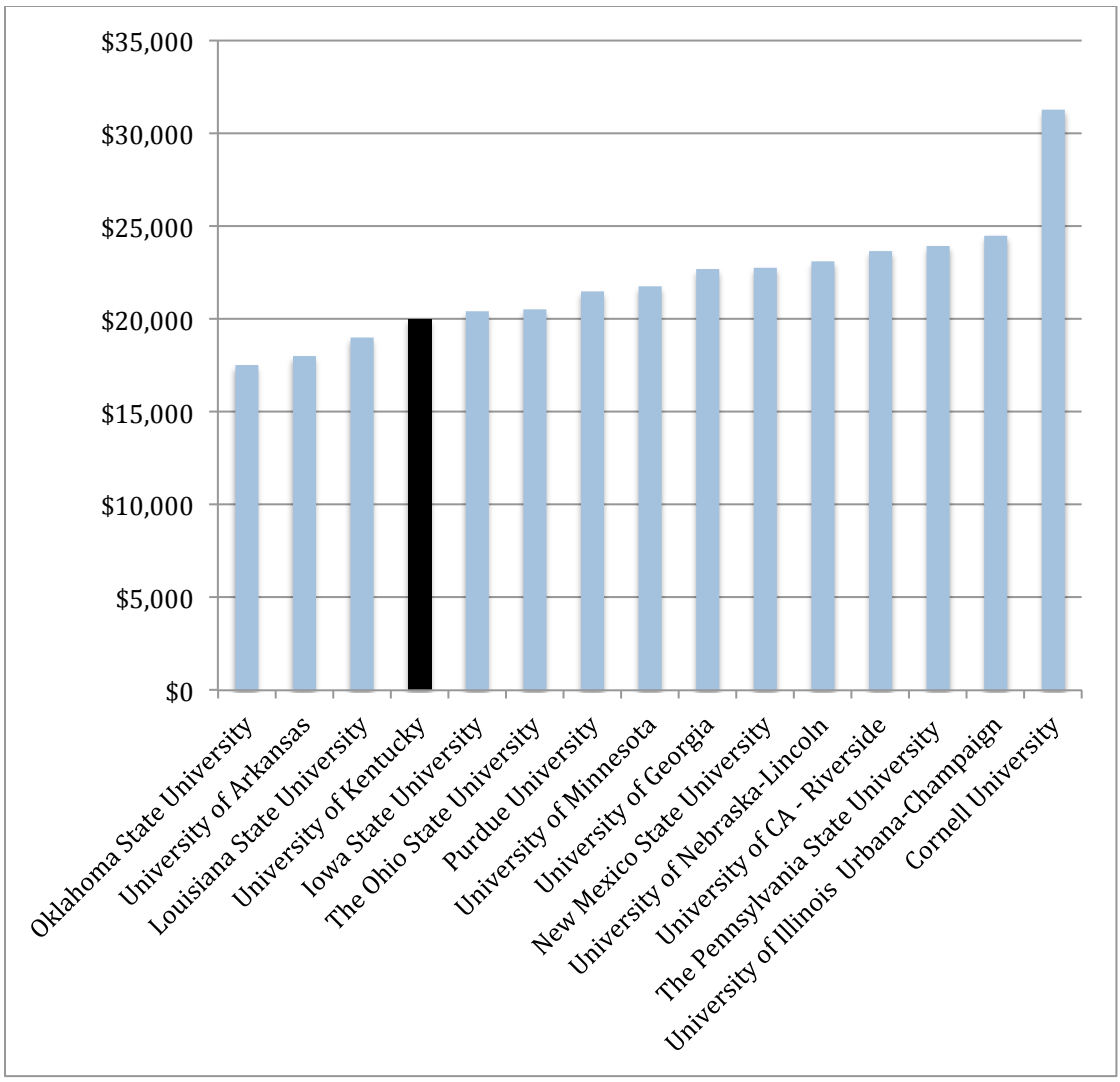
Appendix 11

Graduate Student Cost, Funding and Benchmarks

	Stipend	Stipend+Fringe	Tuition/yr	Health Insurance/yr	Total	RCTF funds
FY10	$20,000.00	$21,730	$8,281.25	$964.00	$30,975.25	$278,720.00
FY11	$20,000.00	$21,730	$8,820.00	$1,162.00	$31,712.00	$295,408.00
FY12	$20,000.00	$21,730	$9,378.00	$1,376.00	$32,484.00	$297,785.00
FY13	$20,000.00	$21,730	$9,960.00	$1,646.00	$33,336.00	$277,997.00
FY14	$20,000.00	$21,730	$10,264.00	$1,882.00	$33,876.00	$285,925.00
FY15	$20,000.00	$21,730	$10,814.00	$2,022.00	$34,566.00	$344,796.00
AVERAGE						$296,771.83



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$30,000
$25,000
$20,000
$15,000
$10,000
$5,000
$0
Oklahoma State University
University of Arkansas
Louisiana State University
University of Kentucky
Iowa State University
The Ohio State University
Purdue University
University of Minnesota
University of Georgia
New Mexico State University
University of Nebraska-Lincoln
University of CA - Riverside
The Pennsylvania State University
University of Illinois Urbana-Champaign
Cornell University

Appendix 12

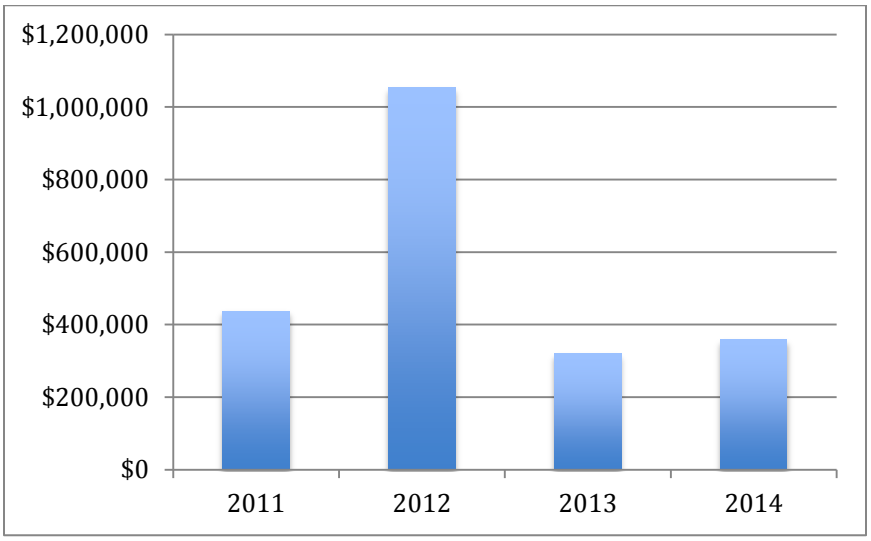
Competitive Awards,

Enrichment Base and Grants

Appendix 12

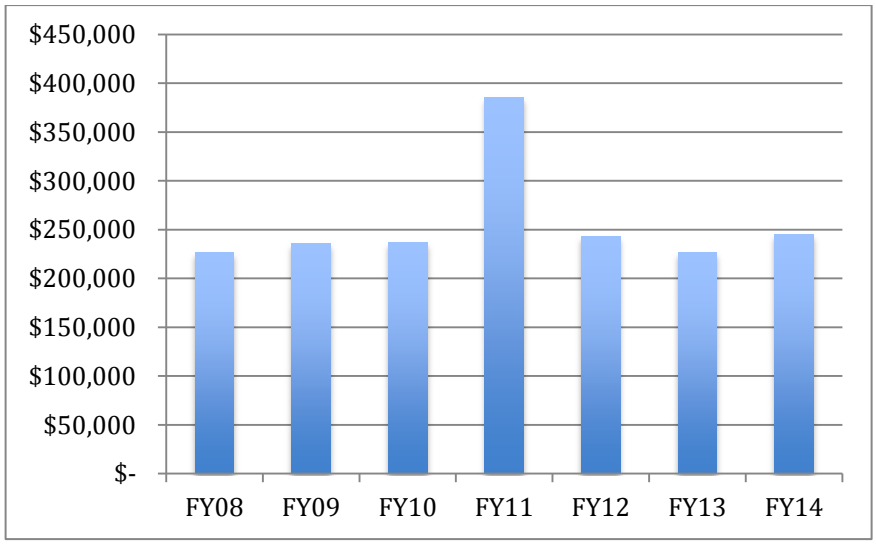
Competitive Federal Funding

FY	Amount
2011	$437,466
2012	$1,054,129
2013	$320,981
2014	$359,682



Enrichment Base (Indirect Costs)

FY	F&A
FY08	$226,647 FY10
FY09	$235,573 FY11
FY10	$237,093 FY12
FY11	$385,170 FY13
FY12	$242,822 FY14
FY13	$226,472 FY15
FY14	$245,145 FY16



Appendix 12

Grants to Plant Pathology

Last Name	First Name	Title	Dept. Code	Start	End	**Current Budget**	Sponsor Name
Ghabrial	Said	Construction of a DNA-Based Virus Induced Gene Silencing Tools for Functional Genomics of Soybeans	81120	7/1/2009	2/28/2010	**$36,380**	University of Illinois
Schardl	Christopher	KSEF RDE: Development and deployment of a non-toxic endophyte in tall fescue for forage	81120	7/1/2009	6/30/2010	**$42,480**	KY Science and Technology Co Inc.
Seebold	Kenneth	KSEF RDE: Investigating the Role of the Cuticle in Resistance to Foliar Plant Pathogens	81120	7/1/2009	6/30/2010	**$40,064**	KY Science and Technology Co Inc.
Seebold	Kenneth	Managing Phytophthora capsici on Pepper and Summer Squash with Combinations of Bioten and Conventional Fungicides	81120	8/1/2009	1/31/2011	**$10,000**	University of Florida
Vincelli	Paul	New Crop Opportunities, Phase X: Scope 1	81120	8/15/2009	8/14/2012	**$27,898**	Cooperative State Research Education and Extension
Schardl	Christopher	Advanced Genetic Technologies, KY	81120	9/1/2009	8/31/2012	**$421,394**	Cooperative State Research Education and Extension
Schardl	Christopher	Plant and Endophyte Gene Expression and Metabolism in Response to Stress and Parasitism	81120	11/1/2009	4/30/2013	**$489,749**	Agricultural Research Service
Vincelli	Paul	Improvement and Deployment of Rapid Standardized PCR Diagnostic Tools to Increase Detection Capacity for High-Impact Plant Pathogens	81120	2/1/2010	1/31/2013	**$135,772**	University of Florida
Ghabrial	Said	Construction of a DNA-based virus induced gene silencing tools for functional genomics of soybean development	81120	3/1/2010	5/31/2011	**$37,677**	University of Illinois
Ghabrial	Said	Multiple Disease Resistant Soybeans: Gene Discovery and Transfer of Disease Resistance into Soybean	81120	4/1/2010	9/30/2013	**$163,053**	University of Illinois
Ghabrial	Said	Use of a Novel Virus-Based Vector in Search for Resistance to the Soybean Cyst Nematode and Other Important Soybean Pathogens	81120	4/1/2010	12/31/2011	**$30,563**	KY Soybean Promotion Board

Hershman	Donald	2010 Kentucky Soybean Rust Monitoring and Early Warning System	81120	4/1/2010	3/31/2011	**$50,000**	KY Soybean Promotion Board
Hershman	Donald	Can Foliar Applied Fungicides Reduce Yield Loss in Soybean Caused by Soybean Cyst Nematode?	81120	4/1/2010	3/31/2011	**$20,000**	KY Soybean Promotion Board
Kachroo	Aardra	Engineering Resistance to Bean Pod Mottle Virus in Soybean	81120	4/1/2010	3/31/2011	**$32,575**	KY Soybean Promotion Board
Vaillancourt	Lisa	Genetics of Quantitative Pathogenic Variation in Fusarium Graminearum	81120	4/13/2010	4/12/2012	**$30,591**	Agricultural Research Service
Seebold	Kenneth	Managing Phytophthora capsici on Pepper and Summer Squash with Combinations of Bioten and Conventional Fungicides	81120	4/15/2010	10/14/2011	**$10,000**	University of Florida
Vincelli	Paul	Consulting and Discussions on Fungicide Resistance and Monsanto Commercial Approaches to Plant Health and Disease Control Roundup Ready Cropping Systems.	81120	4/28/2010	4/29/2010	**$1,000**	Monsanto Co
Seebold	Kenneth	Control of Sclerotinia Sclerotiorum on Tomato with Boscalid and Other Fungicides, IR-4	81120	5/1/2010	10/30/2011	**$7,000**	University of Florida
Kachroo	Pradeep	REU Supplement to Support Research of Undergraduate Student: Glycerol Metabolism and Its Role in Biotrophy Versus Necrotrophy in an Arabidopsis/Fungal Hemibiotroph Model System	81120	5/26/2010	4/30/2016	**$6,000**	National Science Foundation
Kachroo	Pradeep	REU supplement: Genetic, molecular and biochemical basis of resistance to turnip crinkle virus in Arabidopsis	81120	6/25/2010	4/30/2011	**$6,000**	Boyce Thompson Institute for Plant Research
Schardl	Christopher	KSEF RDE: Development and deployment of a non-toxic endophyte in tall fescue for forage	81120	7/1/2010	6/30/2011	**$56,183**	KY Science and Technology Co Inc
Seebold	Kenneth	KSEF RDE: Investigating the Role of the Cuticle in Resistance to Foliar Plant Pathogens	81120	7/1/2010	6/30/2011	**$39,936**	KY Science and Technology Co Inc.
Ghabrial	Said	KSEF RDE: Rapid Screening and Expression of Valuable Proteins in Soybean using a Virus-Based Vector	81120	7/1/2010	6/30/2011	**$39,207**	KY Science and Technology Co Inc.

Schardl	Christopher	Advanced Genetic Technologies	81120	9/1/2010	8/31/2013	**$604,934**	National Institute of Food and Agriculture
Kachroo	Aardra	Enhancing Soybean Yield by Manipulating the Expression of Seed Size-Determining Genes	81120	1/1/2011	12/31/2013	**$234,018**	United Soybean Board
Kachroo	Aardra	Reducing Soybean Yield Loss by Enhancing Resistance to Phytophthora Rot	81120	1/1/2011	12/31/2013	**$183,570**	United Soybean Board
Vaillancourt	Lisa	Pathogenicity Determinants of Colletotrichum Graminicola	81120	2/1/2011	6/30/2013	**$136,536**	Monsanto Co
Seebold	Kenneth	Reducing Losses to Potato and Tomato Late Blight by Enhanced Monitoring of Pathogen Populations and Improved Resistant Plants, Education and Extension.	81120	3/1/2011	5/30/2014	**$47,088**	Regents of the University of California Riverside
Ghabrial	Said	Use of a novel virus-based vector in the search for resistance to the soybean cyst nematode and other important soybean pathogens	81120	4/1/2011	12/31/2012	**$30,563**	KY Soybean Promotion Board
Hershman	Donald	2011 Kentucky soybean rust monitoring and early warning system	81120	4/1/2011	3/31/2012	**$26,000**	KY Soybean Promotion Board
Hershman	Donald	Can foliar applied fungicides reduce yield loss in soybean caused by soybean cyst nematode	81120	4/1/2011	3/31/2012	**$21,000**	KY Soybean Promotion Board
Hershman	Donald	Survey for strobilurin-resistant frogeye leaf spot	81120	4/1/2011	12/31/2012	**$18,000**	KY Soybean Promotion Board
Kachroo	Aardra	Engineering resistance to bean pod mottle virus in soybean	81120	4/1/2011	3/31/2012	**$33,943**	KY Soybean Promotion Board
Farman	Mark	REU: Telomere Hypervariability in the Fungus, Magnaporthe Oryzae - A Model Plant Pathogen	81120	5/16/2011	3/31/2012	**$6,963**	National Science Foundation
Hershman	Donald	Investigations into the Occurrence, Distribution, and Impact of Nematodes in Soybean FIelds in the Southern United States	81120	6/1/2011	4/30/2012	**$13,450**	University of Tennessee

Kachroo	Pradeep	REU Supplement to Support Research of Undergraduate Student: Glycerol Metabolism and Its Role in Biotrophy Versus Necrotrophy in an Arabidopsis/Fungal Hemibiotroph Model System	81120	6/8/2011	4/30/2016	**$6,000**	National Science Foundation
Nagy	Peter	Mechanism of Inhibition of +RNA Virus Replication by Cyclophilins	81121	6/15/11	5/31/14	$377,882	University of Florida
Vaillancourt	Lisa	Evaluation and mitigation of anthracnose disease pressure due to the introduction of sorghum for feedstock production.	81120	7/1/2011	6/30/2016	**$270,000**	Pennsylvania State University
Kachroo	Pradeep	Molecular, genetic, and biochemical characterization of oleate-regulated defense gene expression in plants	81120	7/1/2011	6/30/2016	**$200,000**	National Science Foundation
Ghabrial	Said	KSEF RDE: Rapid Screening and Expression of Valuable Proteins in Soybean using a Virus-Based Vector	81120	7/1/2011	6/30/2012	**$41,601**	KY Science and Technology Co Inc.
Kachroo	Aardra	KSEF RDE: Towards Understanding The Mechanisms of Plant Extreme Resistance to Viruses	81120	7/1/2011	6/30/2012	**$40,000**	KY Science and Technology Co Inc.
Nagy	Peter	KSEF RDE: Screening of temperature sensitive and deletion libraries for host factors affecting virus replication	81121	7/1/11	6/30/12	$44,450	Agricultural Research Service
Schardl	Christopher	NSF/EPSCoR: Transforming Kentucky's New Economy with EPSCoR: Ecological Genomics	81120	9/1/2011	8/31/2013	**$176,533**	National Science Foundation
Schardl	Christopher	KY EPSCOR: Transforming Kentucky's New Economy: Kentucky Infrastructure in Ecological Genomics (KIEG)	81120	9/1/2011	8/31/2013	**$686,171**	KY Council on Postsecondary Education
Schardl	Christopher	KY EPSCOR: Transforming Kentucky's New Economy: Kentucky Infrastructure in Ecological Genomics (KIEG)	81120	9/1/2011	9/1/2011	**$0**	KY Science and Technology Co Inc.
Bachi	Paul	Diagnostic Image Series Development for Supporting IPM in the Southern Region	81120	9/1/2011	8/31/2012	**$10,000**	University of Florida
Kachroo	Aardra	Understanding Soybean Responses to Root-Knot and Reniform Nematodes	81120	10/1/2011	9/30/2013	**$132,398**	United Soybean Board
Nagy	Peter	Key role of the multifunctional translation elongation factor in virus replication.	81121	1/15/12	12/31/15	$806,796	University of Florida

Schardl	Christopher	Alteration of alkaloid profiles of forage and turf grasses by genetic manipulation of endophytic fungi	81120	4/1/2012	3/31/2016	**$230,769**	West Virginia University
Hershman	Donald	2012 Kentucky Soybean Rust Monitoring and Early Warning System	81120	4/1/2012	3/31/2013	**$12,000**	KY Soybean Promotion Board
Kachroo	Pradeep	REU: Molecular, genetic, and biochemical characterization of oleate-regulated defense gene expression in plants	81120	6/3/2012	6/30/2016	**$6,000**	National Science Foundation
Hershman	Donald	Effects of Local Corn Debris Management on FHB and DON Levels (Year Two): KY	81120	6/13/2012	6/12/2013	**$4,513**	Agricultural Research Service
Kachroo	Pradeep	REU: Glycerol Metabolism and its Role in Biotrophy Versus Necrotrophy in an Arabidopsis/Fungal Hemibiotroph Model system.	81120	6/15/2012	4/30/2016	**$6,000**	National Science Foundation
Kachroo	Aardra	KSEF RDE: Towards Understanding The Mechanisms of Plant Extreme Resistance to Viruses	81120	7/1/2012	6/30/2013	**$41,253**	KY Science and Technology Co Inc.
Vincelli	Paul	Southern Plant Diagnostic Network, Kentucky Component	81120	7/1/2012	9/30/2015	**$69,000**	University of Florida
Nagy	Peter	KSEF RDE: Screening of temperature sensitive and deletion libraries for host factors affecting virus replication	81121	7/1/12	6/30/13	$54,349	Agricultural Research Service
Farman	Mark	Novel Strategies for Managing Blast Diseases on Rice and Wheat	81120	1/1/2013	12/31/2015	**$295,182**	Kansas State University
Gauthier	Nicole	Elucidating the Spread and Transmissibility of Blueberry Mosaic Virus, a New Disease of Blueberry in the Southeastern U.S.	81120	3/15/2013	3/14/2016	**$15,000**	University of Georgia
Kachroo	Pradeep	REU:Glycerol Metabolism and its Role in Biotrophy Versus Necrotrophy in an Arabidopsis/Fungal Hemibiotroph Model System	81120	3/25/2013	4/30/2016	**$6,000**	National Science Foundation
Hershman	Donald	2013 Kentucky Soybean Rust Monitoring Network and Early Warning System	81120	4/1/2013	3/31/2014	**$12,000**	Kentucky Soybean Promotion Board
Hershman	Donald	Evaluation of Soybean Vein Necrosis-Associated Virus Infected Soybean for Seed Transmission	81120	4/1/2013	6/30/2014	**$18,500**	Kentucky Soybean Promotion Board

Kachroo	Aardra	Broadening host specificity in soybean-rhizobium symbiosis	81120	4/1/2013	3/31/2014	**$42,810**	Kentucky Soybean Promotion Board
Schardl	Christopher	ARS/SCA: Effects of endophyte on survival and regrowth of tall fescueafter drought stress	81120	7/1/2013	4/30/2018	**$216,200**	Agricultural Research Service
Kachroo	Aardra	KSEF RDE: Identifying Factors that Regulate Broad-Spectrum Resistance to Phytophthora	81120	7/1/2013	12/31/2014	**$29,970**	KY Science and Technology Co Inc.
Kachroo	Pradeep	KSEF RDE: Understanding the Interrelationships between the Various Chemical Inducers of Plant Systemic Immunity	81120	7/1/2013	12/31/2014	**$29,970**	KY Science and Technology Co Inc.
Seebold	Kenneth	Integrated use of grafting technology to improve disease resistance and fruit yield in specialty melon production	81120	7/1/2013	5/30/2014	**$4,400**	University of Florida
Goodin	Michael	Population Structure of Coffee Ringspot Virus in Brazil	81120	7/20/2013	5/31/2015	**$69,668**	National Science Foundation
Kachroo	Pradeep	REU: Molecular, genetic, and biochemical charaterization of oleate-regulated defense gene experssion in plants	81120	8/2/2013	6/30/2016	**$6,000**	National Science Foundation
Seebold	Kenneth	Advancing IPM in Kentucky through Extension: 2013-2016	81120	9/1/2013	2/28/2015	**$9,300**	National Institute of Food and Agriculture
Gauthier	Nicole	Advancing IPM in Kentucky through Extension: 2013-2016	81120	9/1/2013	2/28/2015	**$18,862**	National Institute of Food and Agriculture
Gauthier	Nicole	Solving Urban Tree Musteries by Training Better Detectives	81120	10/1/2013	6/30/2014	**$10,427**	KY Division of Forestry
Vaillancourt	Lisa	Testing the Response of Commercial Sweet Sorghum Germplasm to Colletotrichum sublineola	81120	1/1/2014	12/31/2015	**$60,483**	Chromatin Incorporated
Kachroo	Pradeep	REU: Glycerol Metabolism and its Role in Biotrophy Versus Necrotrophy in an Arabidopsis/Fungal Hemibiotroph Model system.	81120	3/20/2014	4/30/2016	**$6,000**	National Science Foundation
Kachroo	Pradeep	REU: Molecular, genetic, and biochemical characterization of oleate-regulated defense geneexpression in plants	81120	3/20/2014	6/30/2016	**$6,000**	National Science Foundation
Kachroo	Aardra	Broadening host specificity in soybean-Rhizobia symbiosis	81120	4/1/2014	3/31/2015	**$62,711**	Kentucky Soybean Promotion

							Board
Nagy	Peter	Mechanism of Inhibition of RNA Virus Replication by Host WW-domain Proteins	81121	4/1/14	3/31/16	$385,000	National Institute of Allergy and Infectious Diseases
Farman	Mark	KSEF RDE: Exploring a Novel Mechanism for Pathogenic Adaptation in Fungi	81120	7/1/2014	12/31/2015	**$30,000**	KY Science and Technology Co Inc.
Gauthier	Nicole	Kentucky IPM Extension and Implementation Program:2014 - 2017	81120	9/1/2014	8/31/2015	**$9,272**	National Institute of Food and Agriculture
Vincelli	Paul	Implement Plan of Work for the Southern Region Sustainable Agricultural Research and Education Professional Development (PDP) Program, Subaward RD309129/5054596	81120	9/1/2014	8/31/2015	**$22,222**	University of Georgia
Vincelli	Paul	Implement Plan of Work for the Southern Region Sustainable Agricultural Research and Education Professional Development (PDP) Program, Subaward RE675-167/4940156	81120	9/1/2014	8/31/2015	**$11,111**	University of Georgia
Vaillancourt	Lisa	NSF EPSCoR: Powering the Kentucky Bioeconomy for a Sustainable Future: Bioinformatics Scope	81120	1/1/2015	7/31/2015	**$19,154**	KY Council on Postsecondary Education
Vincelli	Paul	So. SARE PDP KY Model State	81120	6/8/2015	8/31/2015	**$2,088**	University of Georgia
Schardl	Christopher	KSEF RDE: Remodeling Alkaloid Architecture in Forage Grass Endophytes	81120	7/1/2015	6/30/2016	**$30,000**	KY Science and Technology Co Inc.
Kachroo	Aardra	Broadening Host Specificity in Soybean-Rhizobia Symbiosis	81120	7/1/2015	6/30/2016	**$66,049**	Kentucky Soybean Promotion Board
Nagy	Peter	KSEF RDE: Allosteric Inhibitors of Cellular Hsp70 to Inhibit Virus Replication	81121	7/1/15	6/30/16	$30,000	Agricultural Research Service
Kachroo	Pradeep	REU: Molecular, Genetic, and Biochemical Characterization of Oleate-regulated Defense Gene Expression in Plants	81120	7/7/2015	6/30/2016	**$6,000**	National Science Foundation
Vincelli	Paul	KY SARE PDP Program Assistant	81120	7/21/2015	1/14/2016	**$1,750**	University of Georgia
Vincelli	Paul	KYSARE Training Funds	81120	7/21/2015	7/14/2016	**$8,218**	University of Georgia

Kachroo	Pradeep	REU: Glycerol Metabolism and Its Role in Biotrophy Versus Necrotrophy in an Arabidopsis/fungal Hemibiotrophic Interaction.	81120	7/22/2015	4/30/2016	**$6,000**	National Science Foundation
Kachroo	Aardra	Examining the importance of dynamic trafficking in systemic acquired resistance	81120	8/1/2015	7/31/2018	**$696,000**	National Science Foundation
Farman	Mark	Bet Hedging as a Mechanism of Pathogenic Variation in the Rice Blast Fungus	81120	8/1/2015	7/31/2016	**$100,814**	National Science Foundation
Nagy	Peter	The Cellular Actin Network and Virus Replication	81121	9/1/2015	8/31/2018	**$190,000**	University of Florida

Appendix 13

Research Programs

Appendix 13

RESEARCH NARRATIVES

Mark L. Farman

A large and increasing body of evidence supports a model in which plant pathogenic microbes, such as bacteria and fungi, produce and secrete small proteins — called effectors — that disrupt the ability of the plants to launch an effective defense reaction; and that, furthermore, plant genes for resistance to these pathogens often act by direct or indirect recognition of such effectors to trigger a hypersensitive response that increases resistance to microbial colonization. Plant pathogenic fungi seem to have large numbers of genes encoding such effectors, but Farman's group, working on the rice blast pathosystem (causative agent, *Magnaporthe oryzae*), obtained evidence that many putative effector proteins are differentially expressed among fungal individuals that should be genetically identical, leading them to hypothesize that the rice blast fungus varies the expression of effector genes to bet-hedge against host recognition. Thus, individual fungal colonies may express different sets of effector proteins during host invasion to maximize the chance that some colonies successfully infect the plant. If validated, this hypothesis will inform and may change the way that we breed crops for disease resistance. In reviewing Farman's requests for NSF funds, most reviewers agreed that this hypothesis potentially represents a major and important shift in the current paradigm of plant-microbe interactions, so Farman obtained an Early Concept Grant for Exploratory Research (EAGER) award from the NSF Integrated Organismal Systems program to explore the hypothesis further. He also obtained Kentucky Science and Engineering Foundation funds to explore the practical and commercial importance of this work.

Michael M. Goodin

The Goodin laboratory primarily studies nucleorhabdoviruses, the plant-adapted members of the Rhabdoviridae, which are enveloped viruses with monopartite, minus-sense, single-stranded RNA genomes, of which an exemplar is the rabies virus. Collectively, these viruses represent some of the greatest threats to human, animal, and plant health. Due in large part to the emerging threat of these viruses to agricultural production for a wide variety of crops, there has been renewed interest in plant rhabdovirus research, resulting in a rapid increase in the identification and characterization of new viruses. Like zoonotic animal viruses, plant viruses, particularly those with arthropod vectors, share the ability to jump species barriers, which results in their "emergence" into new populations of potential hosts, often with catastrophic consequences. Additionally, mixed infections in plant hosts and selection pressures imposed by the use of genetic or engineered resistance in modern cultivars drives viral recombination and reassortment. This is clearly illustrated by Chikungunya, dengue, Tomato spotted wilt virus and Tomato yellow leaf curl virus, and by non-vectored viruses such as influenza and SARS20, among others. The rapidity and increasing

scale with which humans and agricultural produce are transported around the globe presents opportunities for viruses to establish epidemics in novel environments. As a consequence, regulatory and inspection services face ever greater challenges in preventing the spread exotic pathogens. Goodin has established collaborations with scientists in Brazil to study coffee ringspot virus (CoRSV), an emerging virus that has dire implications for coffee production if it expands its current geographical and plant host ranges. Indeed, their work with a model host, *Chenopodium quinoa*, showed that a mere 2–4 °C temperature increase over 24 °C growth conditions makes the plant susceptible to this virus. These results could have agronomic implications for coffee production as predictions for the increase in average global surface temperatures are projected for the major coffee growing regions of the world, particularly Brazil, where ~35% of the world's coffee supply is produced.

While focused on plant rhabdoviruses, the Goodin laboratory has been at the forefront in the application of live-cell microscopy to investigate the cellular biology of plant-adapted rhabdoviruses, and related negative-strand RNA viruses, making many seminal contributions particularly regarding the mechanism of nuclear import of viral proteins, their modification of nuclear membranes and identification of host factors implicated in the cell-to-cell movement of these viruses. Recognizing a need for new tools in high-throughput plant functional proteomics research, the Goodin group has constructed the pSITE family of plasmids, a new set of Agrobacterium binary vectors, for stable or transient expression of various autofluorescent protein fusions in plant cells. Additionally, they have generated plant markers for fluorescent highlighting of actin filaments, chromatin, endoplasmic reticulum, and nucleoli.

Aardra P. Kachroo

The long-term goal of Aardra Kachroo's research program is to enhance basic understanding of the interconnections between primary metabolism and defense signaling in plants while also addressing immediate problems in agriculture. Their studies have shown that fatty acid levels regulate multiple plant defense pathways, and that these pathways are conserved in diverse plants including the research model, *Arabidopsis thaliana,* and the major crop species, *Glycine max* (soybean). In collaboration with Pradeep Kachroo's group, they identified the glycerolipid precursor glycerol-3-phosphate (G3P) as a critical mobile inducer of systemic immunity in both *A. thaliana* and soybean. Other research, funded by the United Soybean Board and the Kentucky Soybean Promotion Board, have identified roles for G3P and glycerolipid metabolism in soybean defense against *Phytophthora sojae*, a major threat to soybean production in the United States. They have shown that enzymes catalyzing the biosynthesis of G3P, and the fatty acids, oleic and linolenic acid, regulate defense against *P. sojae*. They have also identified several components essential for effector-triggered and basal immunity to bacterial blight of soybean (causative agent *Pseudomonas syringae*), and for two of these components they demonstrated that their

direct binding to pathogen effectors regulates virulence functions. Ongoing studies are aimed at understanding how common host factors can detect effectors from diverse pathogens including nematodes, particularly those that are problematic for soybean production in the southern United States.

Another area of interest in Aardra Kachroo's laboratory is pathways contributing to soybean defense against bean pod mottle virus (BPMV) and soybean mosaic virus (SMV). The soybean-SMV pathosystem exhibits the uniquely informative phenomenon called extreme resistance, plants are seemingly symptomless and the virus is confined to the initial infected cell(s) despite the lack of detectable phenotypes normally associated with a resistant response. This group has found two components that are essential for extreme resistance, and that a receptor-like protein derived from a growth-related plant hormone also regulates soybean extreme resistance to SMV.

In collaborative work Aardra Kachroo's group have found that factors responsible for light sensing in plants are important regulators of defense against viruses. Our research demonstrated, for the first time, a mechanistic role for this important environmental factor in regulating plant defense. These significant findings and their impact on the field were highlighted by Faculty of 1000, and The Ag Magazine (a University of Kentucky, College of Agriculture publication).

Pradeep Kachroo

Research in Pradeep Kachroo's laboratory currently relates to the following aspects of plant defense to microbial pathogens: 1. Microbial defense mediated by changes in the fatty acid, oleic acid. 2. Role of glycerol metabolism in basal and induced defense signaling. 3. Role of the plant cuticle in microbial defense. 4. Role of light and the RNA silencing machinery in plant-virus interactions.

Pradeep Kachroo's finding that the fatty acid (FA), oleic acid, modulates defense signaling in plants has established a unique role for fatty acids in plant defense. They showed that the oleic acid-regulated pathway is highly conserved among diverse plants and induces a very robust form of plant resistance via the activation of resistance (R) protein-mediated signaling, and have identified several molecular components that participate in this oleic acid-mediated pathway. Genetic analysis involves the characterization of mutations that suppress defense signaling under low oleic acid conditions. Biochemical analysis involves the identification and characterization of oleic acid-binding proteins.

The Kachroo group, collaborating with Vaillancourt's group, also showed recently that elevated glycerol-3-phosphate (G3P) levels in the plant contribute to basal resistance of arabidopsis against the hemibiotrophic fungus, *Colletotrichum higginsianum*, a model system for the devastating anthracnose diseases of many crops and vegetables. They have also shown that glycerol metabolism participates in induced resistance leading to

systemic acquired response (SAR), a form of defense throughout the plant that provides resistance against a broad spectrum of pathogens. SAR can be triggered by transient infection with an avirulent pathogen, which triggers generation of a mobile signal(s) that remained elusive for many decades. In a recent breakthrough, Pradeep and Aardra Kachroo's groups identified G3P as a signal for SAR and showed that it aids in movement of factors required for establishment of SAR. These findings were published in the high profile journal Nature Genetics and highlighted in the Science Daily and reviewed by the Faculty of 1000. The current focus is to determine structural-functional relationship and downstream signaling mediated by the SAR signal.

In other recent studies the plant cuticle, previously considered a strictly physical barrier to infection, was shown to play a signaling role in innate immune response as well as SAR. The identification of mutants impaired in various steps of cuticle development as well as SAR, together with development of new tools for identification of cuticular components, are being employed to characterize how cuticle functions in SAR, R protein - mediated resistance, and basal resistance.

Pradeep Kachroo's group recently demonstrated a direct role for blue-light photoreceptors in R protein-mediated plant defense against turnip crinkle virus (TCV) in arabidopsis. The blue-light photoreceptors, cryptochrome (CRY) 2 and phototropin (PHOT) 2, are specifically required for maintaining the stability of the plant resistance (R) protein HRT, and thereby resistance to TCV. They further showed the role of CRY2/PHOT2-interacting protein COP1, a E3 ubiquitin ligase, in maintaining post-transcriptional stability of HRT, further indicating that blue -light photoreceptors might be involved in regulation and/or signaling mediated by several R proteins. Their current focus is to determine molecular and biochemical roles of photoreceptors and other signaling components in normal light response, to elucidate the complex interaction of defense and photobiology pathways that fine-tune host responses to microbes.

Peter D. Nagy

Plus-stranded RNA viruses, which pose significant risks to human health and cause major losses for agriculture, depend heavily on host factors to replicate in infected cells. RNA viruses dramatically rearrange host subcellular membranes to build replication complexes that support robust RNA replication in the cytosol of infected cells. RNA viruses also recruit cellular proteins and greatly alter cellular pathways to aid viral replication. Such host-virus interactions are highly complex, require research tools from systems biology to cellular and molecular approaches, and are currently among the most intensively studied research areas due to the promising new antiviral approaches emerging from these studies. Peter Nagy's group has made tomato bushy stunt tombusvirus (TBSV) a model for such research by developing a system for virus RNA replication in yeast, thereby greatly facilitating the rapid discovery of novel cellular factors and dissecting their functions in plus-strand RNA virus replication. Using this

system, they have performed several complementary genome-wide screens, as well as global proteomics and lipidomics approaches, and thereby identified approximately 500 host factors affecting viral RNA replication. The Nagy lab has followed up on roles of co-opted host factors in the assembly of the viral replicase complex; (ii) role of Hsp70 and lipids in activation of the viral polymerase; (iii) identification and characterization of cellular RNA helicases that facilitate TBSV replication; (iv) the role of host factors in TBSV RNA recombination; (v) the role of sterols and phospholipids in the assembly of the viral replicase complex. The knowledge gained has proven to be widely applicable to RNA viruses of plants and animals. For example, several host factors defined recently for TBSV, such as RNA helicases, eukaryotic translation elongation factor 1A (eEF1A), heat shock protein 70 chaperones (Hsp70), ESCRT proteins and cyclophilins, have been implicated in the replication of plant and animal viruses, demonstrating the advantage of the yeast-tombusvirus system developed by the Nagy group for identifying important host factors in a wide range of host-virus pathosystems.

Christopher L. Schardl

While serving as Department Chair, Schardl continues to maintain an active research program on plant-endophytic fungi, with both applied and basic aims. The major applied aims are to utilize seed-transmitted symbiotic fungi (endophytes) for biological protection of temperate grasses, and to reduce the potential for livestock to suffer toxicosis from endophytes that can inhabit and produce toxic alkaloids in forage or weed plants. In this respect, primary focus is on the common temperate forage grass, tall fescue, and its common endophyte, *Epichloë coenophiala*. In temperate U.S. pasturelands, the most common strains of *E. coenophiala* produce a complex ergot alkaloid, ergovaline, which is thought to be the cause of fescue toxicosis in livestock. The endophyte is necessary to confer stress tolerances that make tall fescue a viable forage crop, so identification or generation of nontoxic strains is desirable. To generate such strains, Schardl's group use molecular genetic techniques to eliminate genes for ergovaline biosynthesis, but have modified those techniques to avoid any net introduction of marker genes—that is, to avoid leaving any genes other than originally present in the *E. coenophiala* genome—in order to obviate concerns of regulatory agencies and the public. Schardl's basic research is to elucidate the genetics, diversity and evolution of several bioactive fungal alkaloids: ergot alkaloids, which have toxicological as well as pharmaceutical significance; swainsonine, which is another livestock toxin produced by endophytes in "locoweed" legumes; and lolines, which are nontoxic to livestock but help protect plants against insects. This work pioneers techniques in comparative genomics and phylogenomics, and also informs applied research into the roles and uses of fungal endophytes in plant protection.

Appendix 13

Lisa J. Vaillancourt

Corn was the most valuable crop grown in Kentucky in 2013, worth more than $63 million, and fungal stalk rots are among the most important diseases on corn worldwide, estimated in 2013 to have caused yield losses of at least $3 billion in the U.S., including at least $3 million dollars in Kentucky. The long-term aim of Lisa Vaillancourt's research program is to develop a detailed cellular and molecular explanation of stalk rot, and ultimately to develop viable management tools for its control. Their main focus has been the most important stalk rot fungus, *Colletotrichum graminicola*. Following on their 2012 *C. graminicola* genome paper in the extremely high-impact journal, Nature Genetics, they have been engaged in detailed analysis of the genome data, and in planta transcriptome analysis of wild-type (WT) *C. graminicola* compared to a non-pathogenic mutant to pinpoint candidate genes involved in the establishment of biotrophic phase of the infection cycle. Dr. Vaillancourt's group also studies of other pathogenic *Colletotrichum* species, such as the potential for *C. sublineola* to impact sweet sorghum production in the eastern U.S. for biofuels (collaboration with The Pennsylvania State University and ICRISAT). In a comparative genomic study of *C. graminicola* and *C. sublineola* they have identified potential host specificity determinants among the secreted protein effectors and secondary metabolite genes. Amassing and analyzing a collection of >350 genetically diverse isolates from Kentucky, Alabama, Georgia, and Florida, they found evidence that isolates from the weedy wild sorghum, Johnson grass, can cause disease in sweet sorghum, but are not as aggressive as isolates from grain or sweet sorghum. In another project with Brazilian collaborators, they demonstrated the presence of multiple species of *Colletotrichum* inhabiting anthracnose lesions on common bean. Together with Extension Assistant Professor, Nicole Ward Gauthier, Vaillancourt advised a Fulbright scholar in M.S. research on the diversity of *Colletotrichum* isolates causing bitter rot disease of Kentucky apples. Also, taking a lead role on the NC1183 multistate project, Vaillancourt is broadening studies on two other corn stalk rot fungi, *Fusarium graminearum* and *Diplodia maydis*, both of which also cause important ear rots, and have the potential to produce harmful mycotoxins.

Appendix 14

Extension Publications

Appendix 14

Extension programming by the Plant Pathology Extension team is typically grounded in the needs of County Extension Agents. We also work closely with diverse commodity/farming groups. We are always open to working with stakeholder groups with an interest in agriculture, food systems, sustainability (including environmental and social dimensions), forest heath, food security and food sovereignty, and other issues that relate in some way to our expertise.

The PPAEXT team has a weekly/biweekly newsletter, *Kentucky Pest News*: https://kentuckypestnews.wordpress.com/about/. In addition, ***selected*** publications are listed below, in order to illustrate the breadth of published Extension materials produced by the team.

Paul Vincelli

- Vincelli, P. 2015. Scientific Consensus as a Foundation for Extension Programming. Journal of Extension 53:1COM2. http://www.joe.org/joe/2015february/comm2.php
- Vincelli, P. and G. Munshaw. Chemical Control of Turfgrass Diseases, 2013 and 2014. PPA-1. Used by turfgrass specialists nationwide. (minor revision annually)
- Munshaw, G., and Vincelli, P. Considering the Environment in the Maintenance of Your Kentucky Lawn. UK Extension publication ID-222, http://www2.ca.uky.edu/agc/pubs/ID/ID222/ID222.pdf (major revision of ID-222)
- Vincelli, P., R. McCulley, and J, Humble. 2013. Climate Change Extension: Presenting the Science is Necessary But Insufficient. Waste to Worth Conference, Denver, 2013. Online at http://bit.ly/Xabqmm
- Vincelli, P., Meyer, L., Burris, R., Coolong, T., Bessin, R., Bewley, J., Taraba, J., Barnes, T., McCulley, R., and Wagner, G. 2011. Climate Change: A Brief Summary for Kentucky Extension Agents. ID-191, 4 pp.
- Vincelli, P. 2009. Technology transfer in Extension: Experience in the United States of America. Pages 55-58 in: Knowledge And Technology Transfer for Plant Pathology. N. Hardwick and M. L. Gullino, eds., Springer, Dordrecht. 123 pp.

Nicole Gauthier

Online Extension Publications (eXtension)

- **Ward Gauthier, N.**, Koester, D., Tewksbury, F. 2014. Vineyard Sanitation for Pest Control. Grape Communities of Practice (*adaptations from original Extension publication PPFS-GEN-05*).
- **Ward Gauthier, N.**, Koester, D., Tewksbury, F. 2013. Fruit, Orchard, and Vineyard Sanitation. Apples (regional resource link) and Blueberries (feature article) Communities of Practice (*adaptations from original Extension publication PPFS-GEN-05*).
- **Ward Gauthier, N.**, Sears, A. 2014. Managing Diseases without Fungicides – A Focus on Sanitation (Garden Professors series) Consumer Horticulture Community of Practice (*adaptations from original Extension publication PPFS-GEN-04.)*

Extension Publications (College of Agriculture numbered series, Peer-Reviewed)

- Extension publications published through AgCommunications as well as PPFS departmental series: 4 publications in 2011; 13 in 2012; 9 in 2013; 15 in 2014.
- Examples include:
- Williams-Woodward, J., Ivors, K, **Ward Gauthier, N.**, and Windham, A. 2014. Relative Effectiveness of Various Chemicals for Disease Control of Ornamental Plants. 3 pp. (*new publication, compilation of sources*). Also available as a UK publication PPFS-GEN-13.
- **Ward Gauthier, N.**, Kaiser, C., Goodin, K., Williams, J. 2014. Stress and Decline in Woody Plants (ID-50). 11pp. (*major revision*).
- **Ward Gauthier, N.**, Fox, S., Wimberly, K. 2014. How Dry Seasons Affect Woody Plants (ID-89). 7 pp. (*major revision*).

- **Ward Gauthier, N.**, Kaiser, C., Klahr, M. 2014. Transplant Shock: Disease or Cultural Problem? (PPFS-OR-W-19). 10 pp. (*major revision*).
- Weinzierl, R., Babadoost, M., Lewis, D., Gleason, M. L., Bessin, R. T., Strang, J. G., Wright, S., **Ward Gauthier, N.**, Welty, C., Ellis, Foster, R. E., Hirst, P. M., Weller, S. C., Beckerman, J., McManus, P. S. 2014. Midwest Tree Fruit Spray Guide (ID-92). 68 pp. (*major revisions 2012, 2013, and 2014 made annually, Midwest Fruit Workers*).
- Kaiser, C. A., Ward, N. A., Durham, R. E. 2013. Leaf Scorch and Winter Drying of Woody Plants (ID-51, PPFS-OR-W-17). 4 pp. (*major revision*)
- Kaiser, C. **Ward Gauthier, N**., Townsend, L., Durham, L. 2013. What's Wrong with My Taxus? (ID-52). 4 pp. (*major revision*).
- **Ward, N**. **A**., Ritchey, E. L., Kaiser, C. A. 2013. Iron Deficiency of Woody Plants (ID-84). 4 pp. (*major revision*).
- Durham, R. E., Strang, J. G., **Ward, N. A.**, and Bessin, R. 2012 & 2013. Disease and Insect Control Programs for Homegrown Fruit in Kentucky (ID-21). 20 pp. (*minor revision*).
- Bale, S., Durham, R., Phillips, T., Townsend, L., **Ward, N.A.** 2012 & 2013. Roses (ID-118). 16 pp. (*minor revision*).
- Durham, R., Coolong, T., Strang, J., Williams, M., Wright, S., Bessin, R., Seebold, K., **Ward, N.** 2012. Home Vegetable Gardening in Kentucky (ID-128). 50 pp. (*revision*).
- Weinzierl, R., Babadoost, M., Lewis, D., Gleason, M., Strang, J., Wright, S., Bessin, R., **Ward Gauthier, N.**, Warmund, M., Gao, G., Doohan, D., Welty, C., Ellis, M., Bordelon, B., Foster, R., Beckerman, J., McManus, P. 2012. Midwest Small Fruit and Grape Spray Guide (ID-94). 85 pp. (*major revisions 2012 & 2013, made annually, Midwest Fruit Workers*).
- **Ward, N. A**., Hershman, D., Dunwell, W. 2011. Soybean Cyst Nematode: A Potential Problem for Nurseries (ID-110). 4 pp. (*revision*).
- **Ward, N. A.**, Vanek, S., Fountain, W., Dunwell, W. 2011. Woody Plant Disease Management Guide for Kentucky Nurseries & Landscapes (ID-88). 16 pp. (*major revision*).

- ***Books, book chapters***
  - **Ward, N. A.,** Schneider, R. W., and Cai, G. 2015. Cercospora Blight, Leaf Spot, and Purple Seed Stain. In: Hartman, G. L. and J. C. Rupe (eds). Compendium of Soybean Diseases. 5th ed. American Phytopathological Society. (*in press*).
  - Fulcher, A., **Ward Gauthier, N**., Klingeman, W., and Hale, F. 2014. Blueberry – *Vaccinium* spp. In: *IPM for Shrubs in Southeastern US Nursery Production* Vol I. White, S. and Klingeman, W. (eds). Southern Nursery IPM working Group. Print ISBN: 978-0-9854998-2-2. Co-authors: Braman, S.K., Chappell, M.R., Chong, J-H, Derr, J.F., Dunwell, W.C., Fulcher, A., Hale, F.A., Klingeman, W.E., Knox, G.W., LeBude, A.V., Paret, M.L., Neal, J.C., Ward Gauthier, N., White, S.A., Williams-Woodward, J., and Windham, A.S.
  - Klingeman, W., White, S., LeBude, A., **Ward Gauthier, N**., Hale, F., and Fulcher, A. 2014. Blueberry – *Vaccinium* spp. In: *IPM for Shrubs in Southeastern US Nursery Production* Vol I. White, S. and Klingeman, W. (eds). Southern Nursery IPM working Group. Print ISBN: 978-0-9854998-2-2. Co-authors: Braman, S.K., Chappell, M.R., Chong, J-H, Derr, J.F., Dunwell, W.C., Fulcher, A., Hale, F.A., Klingeman, W.E., Knox, G.W., LeBude, A.V., Paret, M.L., Neal, J.C., Ward Gauthier, N., White, S.A., Williams-Woodward, J., and Windham, A.S.
  - Stafne, E. and **Ward, N.** 2013. Blueberry Growth and Development. In: *Midwest Blueberry Production Guide.* **Ward, N. A.,** and C. A. Kaiser (eds). Midwest Fruit Workers Working Group. (*hard-copy publication TBD, temporarily available online as ID-210).* Co-authors: Barnes, T., Gao, G., Isaacs, R., Johnson, D., Smigell, C., Stafne, E., Ward, N., Wolfe, D., Wright, S.
  - Stafne, E. and **Ward, N.** 2013. Introduction to Blueberry Production. In: *Midwest Blueberry Production Guide.* **Ward, N. A.,** and C. A. Kaiser (eds). Midwest Fruit Workers Working Group. (*hard-copy publication TBD, temporarily available online as ID-210).* Co-authors: Barnes, T., Gao, G., Isaacs, R., Johnson, D., Smigell, C., Stafne, E., Ward, N., Wolfe, D., Wright, S.

- **Ward, N.** 2013. Blueberry Diseases. In: *Midwest Blueberry Production Guide.* **Ward, N. A.,** and C. A. Kaiser (eds). Midwest Fruit Workers Working Group. (*hard-copy publication TBD, temporarily available online as ID-210*). Co-authors: Barnes, T., Gao, G., Isaacs, R., Johnson, D., Smigell, C., Stafne, E., Ward, N., Wolfe, D., Wright, S.
- **Ward, N.**, and Hanson, E. 2013. Site Selection for Blueberry Production. In: *Midwest Blueberry Production Guide.* **Ward, N. A.,** and C. A. Kaiser (eds). Midwest Fruit Workers Working Group. (*hard-copy publication TBD, temporarily available online as ID-210*). Co-authors: Barnes, T., Gao, G., Isaacs, R., Johnson, D., Smigell, C., Stafne, E., Ward, N., Wolfe, D., Wright, S.
- **Ward, N.,** Smigell, C., and Strang, J. 2013. Types of Blueberries and Cultivar Selection. In: *Midwest Blueberry Production Guide.* **Ward, N. A.,** and C. A. Kaiser (eds). Midwest Fruit Workers Working Group. (*hard-copy publication TBD, temporarily available online as ID-210*). Co-authors: Barnes, T., Gao, G., Isaacs, R., Johnson, D., Smigell, C., Stafne, E., Ward, N., Wolfe, D., Wright, S.
- Adkins, C.R., Frank, S. D., Fulcher, A. F., and **Ward, N. A**. 2012. Birch. In: *IPM for Select Deciduous Trees in Southeastern US Nursery Production*. Fulcher, A. F. and S. A. White (eds). Southern Nursery IPM Working Group. 323 pp. ISBN: 978-0-9854998-1-5. Co-authors: Adkins, C.R., Braman, S.K., Chappell, M.R., Chong, J-H, Derr, J.F., Dunwell, W.C., Frank, S.D., Fulcher, A.F., Hale, F.A., Klingeman, W.E., Knox, G.W., LeBude, A.V., Paret, M.L., Neal, J.C., Sidebottom, J.R., Ward, N.A., White, S.A., Williams-Woodward, J.L., and Windham, A.S.
- Adkins, C.R., **Ward, N. A**., Braman, S. K., and White, S. A. 2012. Redbud. In: *IPM for Select Deciduous Trees in Southeastern US Nursery Production*. Fulcher, A. F. and S. A. White (eds). Southern Nursery IPM Working Group. 323 pp. Co-authors: Adkins, C.R., Braman, S.K., Chappell, M.R., Chong, J-H, Derr, J.F., Dunwell, W.C., Frank, S.D., Fulcher, A.F., Hale, F.A., Klingeman, W.E., Knox, G.W., LeBude, A.V., Paret, M.L., Neal, J.C., Sidebottom, J.R., Ward, N.A., White, S.A., Williams-Woodward, J.L., and Windham, A.S.
- Chong, J. H., **Ward, N. A**., and White, S. A. 2012. Cherry. In: *IPM for Select Deciduous Trees in Southeastern US Nursery Production*. Fulcher, A. F. and S. A. White (eds). Southern Nursery IPM Working Group. 323 pp. Co-authors: Adkins, C.R., Braman, S.K., Chappell, M.R., Chong, J-H, Derr, J.F., Dunwell, W.C., Frank, S.D., Fulcher, A.F., Hale, F.A., Klingeman, W.E., Knox, G.W., LeBude, A.V., Paret, M.L., Neal, J.C., Sidebottom, J.R., Ward, N.A., White, S.A., Williams-Woodward, J.L., and Windham, A.S.
- Dunwell, W. C., Chong, J. H., **Ward, N. A**., and Chappell, M. R. 2012. Oak. In: *IPM for Select Deciduous Trees in Southeastern US Nursery Production*. Fulcher, A. F. and S. A. White (eds). Southern Nursery IPM Working Group. 323 pp. Co-authors: Adkins, C.R., Braman, S.K., Chappell, M.R., Chong, J-H, Derr, J.F., Dunwell, W.C., Frank, S.D., Fulcher, A.F., Hale, F.A., Klingeman, W.E., Knox, G.W., LeBude, A.V., Paret, M.L., Neal, J.C., Sidebottom, J.R., Ward, N.A., White, S.A., Williams-Woodward, J.L., and Windham, A.S.
- Frank, S. D., Klingman, W. E., **Ward, N. A**., White, S. A., and Fulcher, A. F. 2012. Maple. In: *IPM for Select Deciduous Trees in Southeastern US Nursery Production*. Fulcher, A. F. and S. A. White (eds). Southern Nursery IPM Working Group. 323 pp. Co-authors: Adkins, C.R., Braman, S.K., Chappell, M.R., Chong, J-H, Derr, J.F., Dunwell, W.C., Frank, S.D., Fulcher, A.F., Hale, F.A., Klingeman, W.E., Knox, G.W., LeBude, A.V., Paret, M.L., Neal, J.C., Sidebottom, J.R., Ward, N.A., White, S.A., Williams-Woodward, J.L., and Windham, A.S.

Websites and Mobile Apps

- Plant Disease Prediction Models, UK AgWeather Center. 2012 & 2013. Updated and revised; developed educational tools for grower training. Collaboration with John Strang, Ric Bessin, Tom Priddy, Matt Dixon, and Wanhong Wang. (*available as a webpage and as a mobile application*)
- Midwest Tree Fruit Spray Guide. 2014. New mobile application and adaptation of the tree fruit and small fruit spray guide series as “apps” formatted for phones and tablets. *(in progress, complete 2015).*

Carl Bradley
(Joined faculty within past six months)

Emily Pfeufer
(Joined faculty within past six months)

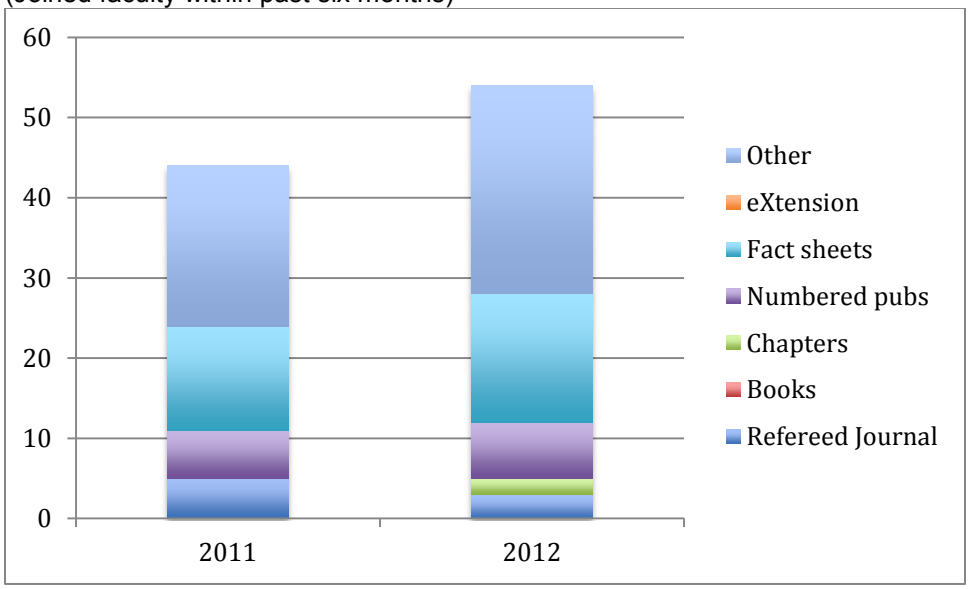


Figure 51.1 Extension publications in 2011 and 2012. As an indication of typical productivity, we are showing the two years of the study period during which the program included four Extension faculty members (although one started her appointment at the beginning of August, 2011).

Appendix 15

Faculty Curriculum Vitae

CARL A. BRADLEY

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University of Kentucky – Research & Education Center
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EDUCATION:

2001 Doctor of Philosophy in Crop Sciences (Plant Pathology), University of Illinois at Urbana-Champaign
1999 Master of Science in Plant Pathology, University of Illinois at Urbana-Champaign
1995 Bachelor of Science in Plant and Soil Science, Southern Illinois University at Carbondale

PROFESSIONAL EXPERIENCE:

2015-present Extension Professor, University of Kentucky, Department of Plant Pathology
2011-2015 Associate Professor of Plant Pathology / Extension Specialist, University of Illinois, Department of Crop Sciences
2007-2011 Assistant Professor of Plant Pathology / Extension Specialist, University of Illinois, Department of Crop Sciences
2002-2006 Assistant Professor / Extension Plant Pathologist, North Dakota State University, Department of Plant Pathology
2001-2002 Postdoctoral Fellow in Plant Pathology, University of Idaho, Department of Plant, Soil, and Entomological Sciences
1997-2001 Research Specialist in Agriculture, University of Illinois at Urbana-Champaign, Department of Crop Sciences
1995-1997 Graduate Research Assistant, University of Illinois at Urbana-Champaign, Department of Crop Sciences

TEACHING EXPERIENCE:

Classes taught

- Guest Lecturer for Plant & Soil Science 531, Plant Pest Management Techniques (Fall Semester, 2015, University of Kentucky)
- Taught Plant Pathology 407, Diseases of Field Crops (Fall Semesters 2011 – 2014, University of Illinois)
- Co-Taught Crop Sciences 412, Principles of Crop Advising (Spring Semesters 2011 – 2015, University of Illinois)
- Guest Lecturer for Plant Pathology 204, Introductory Plant Pathology (Spring Semesters 2007 – 2010, University of Illinois)
- Guest Lecturer for Plant Pathology 407, Diseases of Field Crops (Fall Semesters 2008 – 2009, University of Illinois)
- Guest Lecturer for Crop Science 499, Topics in Plant Pathology (Fall Semester 2009, University of Illinois)

- Co-coordinated Plant Pathology 790, Graduate Seminar (Fall and Spring Semesters 2003/04, North Dakota State University)
- Guest Lecturer for Plant Pathology 324, Introduction to Plant Pathology (Fall Semesters 2003, 2004, 2005, and 2006, North Dakota State University)
- Guest Lecturer for Plant Pathology 750, Plant Virology (Spring Semester 2006, North Dakota State University)
- Guest Lecturer for Plant Science 350, Sugarbeet Production (Fall Semesters 2002, 2003, 2004, 2005 and 2006, North Dakota State University)
- Guest Lecturer for Crop Sciences 121, Principles of Field Crop Production & Protection (Fall Semester 1998, University of Illinois)
- Graduate Teaching Assistant for Plant Pathology 204, Introductory Plant Pathology (Spring Semester 1996, University of Illinois)

Graduate student advising

I have been the major adviser for 7 M.S. graduate students and 5 Ph.D. students at North Dakota State University and the University of Illinois. In addition, I have served on advisory committees of over 30 graduate students being advised by fellow faculty members at both the University of Illinois and North Dakota State University.

AWARDS / FELLOWSHIPS / SCHOLARSHIPS:

- Wyffels Hybrids Award for Faculty Excellence, University of Illinois Department of Crop Sciences (2013)
- University of Illinois College of ACES, Faculty Award for Excellence in Extension (2012)
- IPM Achievmenet Award, International Award of Excellence for the Soybean Rust PIPE (team award – 2012)
- United States Department of Agriculture – National Institute of Food and Agriculture Award of Excellence in Multistate Research (team award presented to the NCERA 208 Soybean Rust Committee – 2012)
- List of Teachers at the University of Illinois Ranked as Excellent by their Students (for teaching PLPA 407, Fall 2011)
- American Society of Agronomy, 2010 Educational Materials Awards Program, Certificate of Excellence, Newsletter Category – Presented to contributors of the Illinois Pest Management and Crop Development Bulletin (2010)
- Certificate of Outstanding and Dedicated Service, Presented by the Northarvest Bean Growers Association (2007)
- Excellence Award for Research, Presented by the North Dakota Dry Pea and Lentil Council (2006)
- Myron and Muriel Johnsrud Excellence in Extension Award, Early Career, Presented at the 2004 NDSU College of Agriculture, Food Systems, and Natural Resources Awards Ceremony (2004)
- American Society of Agronomy, 2003 Educational Materials Awards Program, Certificate of Excellence, Newsletter Category – Presented to contributors of the NDSU Crop and Pest Report (2003)
- Illinois Seed Trade Association, Burlison Graduate Fellowship (2000)

- Pioneer Hi-Bred Graduate Fellowship (1996)
- Southern Illinois University, Plant and Soil Science Alumni Scholarship (1995)
- Southern Illinois Fertilizer and Pesticide Conference Scholarship (1994)
- Southern Illinois University, John Moody Heritage Scholarship (1991 to 1995)
- Southern Illinois University, Academic Scholarship (1991)

PROFESSIONAL AFFILIATIONS:

- American Phytopathological Society (1996 to present)
  -Associate Editor for *Plant Disease* (2009-2011; 2013-2015)
  -Section Editor for *Plant Disease Management Reports* (2007-2010)
  -Section Editor for *Fungicide and Nematicide Tests* (2005 to 2006)
- North-Central Division of American Phytopathological Society (1996 to 2000; 2002 to present)
  -Secretary/Treasurer, 2011 to 2015
  -President, 2005 to 2006
  -Vice President, 2004 to 2005
- Canadian Phytopathological Society (2004-present)
- International Association for the Plant Protection Sciences (2011-present)
- Crop Science Society of America (2006 to present)

PUBLICATIONS:

I have authored a total of 77 refereed journal articles, 5 book chapters, and multiple abstracts, proceedings papers, and extension publications. Listed below are refereed journal articles published since 2010.

Refereed journal articles (since 2010)

- Olson, T. R., Gebreil, A., Micijevic, A., **Bradley, C. A.**, Wise, K. A., Mueller, D. S., Chilvers, M. I., and Mathew, F. M. 2015. Association of *Diaporthe longicolla* with black zone lines on mature soybean plants. Plant Health Progress doi:10.1094/PHP-RS-15-0020.
- Agindotan, B. O., Domier, L. L., and **Bradley, C. A.** 2015. Detection and characterization of the first North American mastrevirus in switchgrass. Archives of Virology 160:1313-1317.
- Kandel, Y. R., **Bradley, C. A.**, Wise, K. A., Chilvers, M. I., Tenuta, A. U., Davis, V. M., Esker, P. D., Smith, D. L., Licht, M. A., and Mueller, D. S. 2015. Effect of glyphosate application on sudden death syndrome of soybean under different field conditions. Plant Disease 99:347-354.
- Mehl, K. M., Weems, J. D., Ames, K. A., and **Bradley, C. A.** 2015. Evaluation of foliar-applied copper hydroxide and citric acid for control of Goss's wilt and leaf blight of corn. Canadian Journal of Plant Pathology 37:160-164.
- Zeng, F., Arnao, E., Zhang, G., Olaya, G., Wullschleger, J., Sierotzki, H., Ming, R., Bluhm, B. H., Bond, J. P., Fakhoury, A. M., and **Bradley, C. A.** 2015. Characterization of quinone outside inhibitor fungicide resistance in *Cercospora sojina* and development of diagnostic tools for its identification. Plant Disease 99:544-550.

- Zhang, G., and **Bradley, C. A.** 2014. Survival of *Cercospora sojina* on soybean leaf debris in Illinois. Plant Health Progress doi:10.1094/PHHP-RS-14-0005.
- D'Angelo, D. L., **Bradley, C. A.**, Ames, K. A., Willyerd, K. T., Madden, L. V., and Paul, P. A. 2014. Efficacy of post-anthesis fungicide applications against Fusarium head blight and deoxynivalenol in soft red winter wheat. Plant Disease 98:1387-1397.
- Sikora, E. J., Allen, T. W., Wise, K. A., Bergstrom, G., **Bradley, C. A.**, Bond, J., Brown-Rytlewski, D., Chilvers, M., Damicone, J., DeWolf, E., Dorrance, A., Dufault, N., Esker, Pl, Faske, T., Giesler, L., Goldberg, N., Golod, J., Grau, C., Grybauskas, A., Franc, G., Hammerschmidt, R., Hartman, G. L., Henn, A., Hershman, D., Hollier, C., Isakeit, T., Isard, S., Jacobson, B., Jardine, D., Kemerait, B., Koenning, S., Langham, M., Malvick, D., Markell, S., Marios, J. J., Monfort, S., Mueller, D., Mueller, J., Mulrooney, R., Newman, M., Osborne, L., Padgett, G. B., Ruden, B. E., Rupe, J., Schneider, R., Scwartz, H., Shaner, G., Singh, S., Stromberg, E., Sweets, L., Tenuta, A., Vaiciunas, S., Yange, X. B., Young-Kelly, H., and Zidek, J. 2014. A coordinated effort to manage soybean rust in the North America: a success story in soybean disease monitoring. Plant Disease 98:864-875.
- Nepal, A., Markell, S., Knodel, J., **Bradley, C. A.**, and del Rio Mendoza, L. E. 2014. Prevalence of blackleg and pathogenicity groups of *Leptosphaeria maculans* in North Dakota. Plant Disease 98:328-335.
- Khan, M. F. R., and **Bradley, C. A.** 2013. Effect of glyphosate on *Cercospora beticola* on glyphosate-resistant sugar beet. Journal of Sugar Beet Research 50:1-9.
- Agindotan, B. O., Prasifka, J. R., Gray, M. E., Dietrich, C. H., and **Bradley, C. A.** 2013. Transmission of *Switchgrass mosaic virus* by *Graminella aureovitatta*. Canadian Journal of Plant Pathology 35:384-389.
- Ahonsi, M. O., Ames, K. A., Gray, M. E., and **Bradley, C. A.** 2013. Biomass reducing potential and prospective fungicide control of a new leaf blight of *Miscanthus* x *giganteus* caused by *Leptosphaerulina chartarum*. BioEnergy Research 6:737-745.
- Agindotan, B., Okanu, N., Oladeinde, A., Voigt, T., Long, S., Gray, M., and **Bradley, C. A.** 2013. Detection of *Switchgrass mosaic virus* in *Miscanthus* and other grasses. Canadian Journal of Plant Pathology 35:81-86.
- Delgado, J. A., Lynnes, T. C., Meinhardt, S. W., Wise, K. A., Gudmestad, N. C., **Bradley, C. A.**, Markell, S. G., and Goswami, R. S. 2013. Identification of the mutation responsible for resistance to QoI fungicides and its detection in *Ascochyta rabiei* (teleomorph *Didymella rabiei*). Plant Pathology 62:688-697.
- **Bradley, C. A.** 2012. Factors considered when making corn foliar fungicide application decisions in Illinois. Online. Journal of Extension 50(3) Article 3RIB7, http://www.joe.org/joe/2012june/rb7.php.
- Willyerd, K. T., Li, C., Madden, L. V., **Bradley, C. A.**, Bergstrom, G. C., Sweets, L. E., McMullen, M., Ransom, J. K., Grybauskas, A., Osborne, L., Wegulo, S. N., Hershman, D. E., Wise, K., Bockus, W. W., Groth, D., Dill-Mackey, R., Milus, E., Esker, P. D., Waxman, K. D., Adee, E. A., Ebelhar, S. E., Young, B. G., and Paul, P. A. 2012. Efficacy and stability of integrating fungicide and cultivar

resistance to manage Fusarium head blight and deoxynivalenol in wheat. Plant Disease 96:957-967.

- Zhang, G. R., Newman, M. A., and **Bradley, C. A.** 2012. First report of the soybean frogeye leaf spot fungus (*Cercospora sojina*) resistant to quinone outside inhibitor fungicides in North America. Plant Disease 96:767.
- **Bradley, C. A.**, Wood, A., Zhang, G. R., Murray, J. E., Phillips, D. V., and Ming, R. 2012. Genetic diversity of *Cercospora sojina* revealed by amplified fragment length polymorphism markers. Canadian Journal of Plant Pathology 34:410-416.
- Zhang, G. R., Pedersen, D. K., Phillips, D. V., and **Bradley, C. A.** 2012. Sensitivity of *Cercospora sojina* isolates to quinone outside inhibitor fungicides. Crop Protection 40:63-68.
- Agindotan, B. O., Gray, M. E., Hammond, R. W. and **Bradley, C. A.** 2012. Complete genome sequence of *Switchgrass mosaic virus*, a member of a proposed new species in the genus *Marafivirus*. Archives of Virology 157:1825-1830.
- Peltier, A. J., **Bradley, C. A.**, Chilvers, M. I., Malvick, D. K., Mueller, D. S., Wise, K. A., and Esker, P. D. 2012. Biology, yield loss and control of Sclerotinia stem rot of soybean. Online. Journal of Integrated Pest Management doi: http://dx.doi.org/10.1603/IPM11033.
- **Bradley, C. A.** and Pedersen, D. K. 2011. Baseline sensitivity of *Cercospora zeae-maydis* to quinone outside inhibitor fungicides. Plant Disease 95:189-194.
- Ahonsi, M. O., Agindotan, B. O., Gray, M. E., and **Bradley, C. A.** 2011. First report of basal stem rot and foliar blight caused by *Pythium sylvaticum* on *Miscanthus sinensis* in Illinois. Plant Disease 95:616.
- Wise, K. A., **Bradley, C. A.**, Markell, S., Pasche, J., Delgado, J. A. Goswami, R. S., and Gudmestad, N. C. 2011. Sensitivity of *Ascochyta rabiei* populations to prothioconazole and thiabendazole. Crop Protection 30:1000-1005.
- Qi, M., Wang, D., **Bradley, C. A.**, and Zhao, Y. 2011. Genome sequence analyses of *Pseudomonas savastanoi* pv. *glycinea* and subtractive hybridization-based comparative genomics with nine pseudomonads. PLoS One 6:e16451. doi:10.1371/journal.pone.0016451.
- Bilgi, V. N., **Bradley, C. A.**, Mathew, F. M., Ali, S., and Rasmussen, J. B. 2011. Root rot of dry edible bean caused by *Fusarium graminearum.* Online. Plant Health Progress doi:10.1094/PHP-2011-0425-01-RS.
- Khot, S. D., Bilgi, V. N., del Rio, L. E., and **Bradley, C. A.** 2011. Identification of *Brassica napus* lines with partial resistance to *Sclerotinia sclerotiorum*. Online. Plant Health Progress doi:10.1094/PHP-2010-0422-01-RS.
- Weems, J. D., Ebelhar, S. A., Chapara, V., Pedersen, D. K., Zhang, G. R., and **Bradley, C. A.** 2011. First report of charcoal rot caused by *Macrophomina phaseolina* on sunflower in Illinois. Plant Disease 95:1318.
- Paul, P. A., Madden, L. V., **Bradley, C. A.**, Robertson, A. E., Munkvold, G. P., Shaner, G., Wise, K. A., Malvick, D. K., Allen, T. W., Grybauskas, A., Vincelli, P., and Esker, P. 2011. Meta-analysis of yield response of hybrid field corn to foliar fungicides in the U.S. corn belt. Phytopathology 101:1122-1132.
- Agindotan, B. O., Ahonsi, M. O., Domier, L. L., Gray, M. E., and **Bradley, C. A.** 2010. Application of sequence-independent amplification (SIA) for the

identification of RNA viruses in bioenergy crops. Journal of Virological Methods 169:119-128.

- **Bradley, C. A.** and Ames, K. A. 2010. Effect of foliar fungicides on corn with simulated hail damage. Plant Disease 94:83-86.
- Sims, A. L., Windels, C. E., and **Bradley, C. A.** 2010. Content and potential availability of selected nutrients in field-applied sugar beet factory lime. Communications in Soil Science and Plant Analysis 41:438-453.
- **Bradley, C. A.**, Pataky, N. R., Gulya, T., Friskop, A., Jordahl, J., and Markell, S. 2010. First report of virulence phenotypes of *Puccinia helianthi*, causal agent of sunflower rust in Illinois. Plant Disease 94:273.
- **Bradley, C. A.**, Hines, R. A., Pataky, N. R., Haudenshield, J. S., and Hartman, G. L. 2010. First report of soybean rust, caused by *Phakopsora pachyrhizi*, on kudzu (*Pueraria montana* var. *lobata*) in Illinois. Plant Disease 94:477.
- Ahonsi, M. O., Agindotan, B. O., Williams, D. W., Arundale, R., Gray, M. E., Voigt, T. B., and **Bradley, C. A.** 2010. First report of *Pithomyces chartarum* causing a leaf blight of *Miscanthus* × *giganteus* in Kentucky. Plant Disease 94:480-481.
- **Bradley, C. A.**, Allen, T. W., Dorrance, A. E., Dunphy, E. J., Giesler, L. J., Hershman, D. E., Hollier, C. A., Horn, V., and Wrather, J. A. 2010. Evaluation of the soybean rust pest information platform for extension and education (PIPE) public website's impact on certified crop advisers. Online. Plant Health Progress doi:10.1094/PHP-2010-0701-RS.

GRANT FUNDING:

In total, my research program has received over **$6 million in competitive grant funding** while at North Dakota State University and the University of Illinois. In addition, my research program has received over **$1 million in industry support**. Funding from competitive grants has come from numerous sources such as the United States Department of Agriculture and several commodity check-off boards.

MARK LEWIS FARMAN
BIOSKETCH

CURRENT POSITION

Professor, University of Kentucky, Department of Plant Pathology, July 1st, 2009-present.

EDUCATION/TRAINING

University of East Anglia, Norwich, United Kingdom
B.Sc. Hons. in Biological Sciences, 1983 - 1986.

University of East Anglia, Norwich, United Kingdom
Ph.D. in Molecular Biology, 1986 - 1990.
Thesis title: A study of transformation in *Leptosphaeria maculans*

University of Wisconsin-Madison
Research Associate, 1990 – 1993

University of Wisconsin-Madison
Assistant Researcher, 1993 - 1997

POSITIONS/HONORS

Associate Director, UK Healthcare Genomics Center, July 2015 - present

Outreach coordinator for Kentucky Biomedical Research Infrastructure Network, 2014 – present. Entails development of bioinformatics infrastructure in the Commonwealth of Kentucky

Chief designer, organizer and presenter, Summer Workshops on Next Generation Sequencing and Bioinformatics, held on UK campus in 2012, 2013 and 2014 (80 participants total)

Director, University of Kentucky Advanced Genetic Technologies Center, 2012 - 2015

Member, International Wheat Blast Consortium, 2011-present

Member, Rice Blast Policy Committee, 2001 – present

Basil O' Conner Starter Scholar, March of Dimes Birth Defects Foundation, 1998 - 2000

Professor, University of Kentucky, Department of Plant Pathology, July 1st, 2009 – present

Associate Professor, University of Kentucky, Department of Plant Pathology, July 1st, 2003 – June 30, 2009

Assistant Professor, University of Kentucky, Department of Plant Pathology, March 1st, 1997 - June 30, 2003

PUBLICATIONS (past six years)

Refereed journal articles:

1. Bec S, Ward, T., **Farman, M**., O'Donnell, K., Hershman, D., Van Sanford, D., and Vaillancourt, L. 2015. Characterization of Fusarium strains recovered from wheat with symptoms of head blight in Kentucky. Plant Dis. http://apsjournals.apsnet.org/doi/abs/10.1094/PDIS-06-14-0610-RE
2. Nelson P, Estus S, Abner E, Parikh I, Malik M, Neltner J, Ighodaro E, Wang W-X, Wilfred B, Wang L-S, Kukull W, Nandakumar K, **Farman M**, Poon W, Corrada M, Kawas C, Cribbs D, Bennett D, Schneider J, Larson E, Crane P, Valladares O, Schmidtt F, Kryscio R, Jicha G, Smith C, Scheff S, Sonnen J, Haines L, Pericak-Vance M, Mayeux R, Farrer L, Van Eldik L, Horbinski C, Green R, Gearing M, Poon L, Kramer P, Woltjer R, Montine T, Partch A, Rajic A, Richmire K, Mosell S, Alzheimer's Disease Genetic Consortium, Schellenberg G, Fardo D (2014) ABCC9 gene polymorphism is associated with hippocampal sclerosis of aging pathology. Acta Neuropathol. 127: 825-843.
3. Ramalho, T.O., Figueira, A.R., Sotero, A.J., Wang, R., Geraldino Duarte, P.S., **Farman, M**., and Goodin, M.M. 2014. Characterization of Coffee ringspot virus-Lavras: A model for an emerging threat to coffee production and quality. Virology 464-465:385-396.
4. Schardl C, Young C, Moore N, Krom N, Dupont P-Y, Pan J, Florea S, Webb J, Jaromczyk J, Jaromczyk J, Cox M, **Farman M** (2014) Genomes of plant--associated Clavicipitaceae. Adv. Bot. Res. 70:291-327.
5. Schardl C, Young C, Hesse U, Amyotte S, Andreeva K, Calie P, Fleetwood D, Haws D, Schweri K, Moore N, Oeser B, Voisey C, **Farman M**, Jaromczyk J, O'Sullivan D, Panaccione D, Scott B, Tudzynski P (2013) Plant-symbiotic fungi as chemical engineers: multi-genome analysis of the Clavicipitaceae reveals dynamics of alkaloid loci, PLoS Genet. 9: e1003323.
6. Schardl, C.L., Young, C.A., Pan, J., Florea, S., Takach, J.E., Panaccione, D.G., **Farman, M.L.**, Webb, J.S., Jaromczyk, J., Charlton, N.D., Nagabhyru, P., Chen, L., Shi, C., and Leuchtmann, A. (2013b). Currencies of mutualisms: sources of alkaloid genes in vertically transmitted epichloae. Toxins 5:1064-1088.
7. O'Connell R, Thon M, Hacquard S, Amyotte S, Kleemann J, Torres M, Damm U, Buiate E, Epstein L, Alkan N, Altmuller J, Alvarado-Balderrama L, Bauser C, Becker C, Birren B, Chen Z, Choi J, Crouch JA, Duvick J, **Farman M**, Gan P, Heiman D, Henrissat B, Howard R, Kabbage M, Koch C, Kracher B, Kubo Y, Law A, Lebrun M-H, Lee Y-H, Miyara I, Moore N, Neumann U, Nordstrom K, Panaccione D, Panstruga R, Place M, Proctor R, Prusky D, Rech G, Reinhardt R, Rollins J, Rounsley S, Schardl C, Schwartz D, Shenoy N, Shirasu K, Sikhakolli U, Stuber K, Sukno S, Sweigard J, Takano Y, Takahara H, Trail F, van der Does H, Voll L, Will I, Young S, Zeng Q, Zhang J, Zhou S, Dickman M, Schulze-Lefert P, Themaat E, Ma L, J Vaillancourt L (2012) Lifestyle transitions in plant pathogenic Colletotrichum fungi deciphered by genome and transcriptome analyses. Nature Genet. 44:1060-1065. **Faculty of 1000 recommended reading.**
8. Starnes J, Thornbury D, Novikova O, Rehmeyer C and **Farman M** (2012). Telomere-targeted retrotransposons in the rice blast fungus *Magnaporthe oryzae*: agents of genome instability. Genetics 191:389-406. **Faculty of 1000 recommended reading.**
9. Stajich J, Wilke S, Ahren D, Au C-H, Birren B, Bordovsky M, Burns C, Canback B,

Casselton L, Cheng C, Deng J, Dietrich F, Fargo D, **Farman M** et al. (2010) Insights into evolution of multicellular fungi from the assembled chromosomes of the mushroom *Coprinopsis cinerea* (*Coprinopsis cinereus*). Proc. Natl Acad. Sci., USA 107:11889-11894.

10. de Sa P, Li H, Havens W, **Farman M**. Ghabrial S (2010) Overexpression of the victoriocin genes in *Helminthosporium* (*Cochliobolus*) *victoriae* enhances the antifungal activity of culture filtrates. Phytopathology 100:890-896.

12. Schwartz S and **Farman M** (2010) Systematic overrepresentation of DNA ends and underrepresentation of DNA termini among sequencing templates prepared from hydrodynamically sheared DNA molecules. BMC Genomics 11: 87.

13. Coleman J, Rounsley S, Rodriguez-Carres M, Kuo A, Wasmann C, Grimwood J, Schmutz J, Taga M, White G, Zhou S, Schwartz D, Freitag M, Ma L-J, Danchin E, Henrissat B, Coutinho P, Nelson D, Straney D, Napoli C, Barker B, Gribskov M, Rep M, Kroken S, Molnár I, Rensing C, Kennell J, Zamora J, **Farman M**, Selker E, Salamov A, Shapiro H, Pangilinan J, Lindquist E, Lamers C, Grigoriev I, Geiser D, Covert S, Temporini E, Vanetten H (2009) The genome of *Nectria haematococca*: contributions of supernumary chromosomes to gene expansion. PLoS Genet 5: e1000618.

14. Rehmeyer C, Li W, Kusaba M, **Farman, M** (2009) The telomere-linked helicase (TLH) gene family in *Magnaporthe oryzae*: Revised gene structure reveals a novel TLH-specific protein motif. Curr. Genet. 55: 253-262.

15. Wu C, Kim, Y-S, Smith K, Li W, Hood H, Staben C, Selker E, Sachs M, **Farman M** (2009) Characterization of chromosome ends in the filamentous fungus *Neurospora crassa*. Genetics 181: 1129-1145.

Book Chapters/Reviews:

1. Farman, M., Novikova, O.S., Starnes, J.H., and Thorbury, D.W. 2014. Subtelomere organization, evolution, and dynamics in the rice blast fungus *Magnaporthe oryzae*. Pages 71-99 in: Subtelomeres, E.J. Louis and M.M. Becker, eds. Springer-Verlag, Berlin, Heidelberg.

EXTRAMURAL FUNDING (past six years)

Current:

1. **United States Department of Agriculture - National Institute for Food and Agriculture (USDA-NIFA).** Novel strategies for controlling blast diseases of rice and wheat. B. Valent (PI), M. Farman (Co-PI), R. Dean, E. De Wolf, J. Jia, T. Mitchell, J. Maciel, L. Nalley, P Paul, K. Pedley, G. Peterson, L. Madden, J-R. Xu, J. Stack, H. Trick, Y. Wamishe, G. Wang, 1/1/13-12/31/18, **$5,500,000** (Farman portion $297,000).
2. **National Science Foundation (NSF) – Integrated Organismal System Cluster**. EAGER proposal: Bet-hedging in the rice blast pathogen *Magnaporthe oryzae* to avoid host recognition. **M. Farman (PI)**, 9/1/15 -- 8/31/16, **$100,814** (non-competitive, exploratory award for research with potentially transformative results).

3. **British American Tobacco**. High-throughput screening for fast neutron-induced mutations in the tobacco CBT-ol synthase gene using Illumina amplicon sequencing. D. Zaitlin (PI), M. Farman (Co-PI), 2014/12/18-2016/12/18, **$129,627** (non-competitive.
4. **Kentucky Science and Engineering Foundation**, KSEF-3117-RDE-017. Exploring a novel mechanism for pathogenic adaptation in fungi. M. Farman (PI) 2014/07/01-2015/06/31, **$30,000** (regionally competitive).
5. **Kentucky Science and Engineering Foundation** KSEF-3139-RDE-017B. Long QT gene to function screens that clarify variants of uncertain significance, Delisle (PI), M. Farman (Co-PI), 2014/07/01-2015/06/31, **$30,000** (regionally competitive).

Past:

1. **USDA-National Research Initiative - Functional Genomics of Microbes program,** National Research Initiative 2008-35600-18809. Localization of secreted proteins during penetration and invasive growth of the rice blast fungus *Magnaporthe oryzae*. M. Farman (PI)**,** M. Goodin, B. Valent, C. Soderlund, 1/15/2008 - 1/14/2011, **$990,000** (nationally competitive).
2. **National Science Foundation (NSF) - Molecular and Cellular Biology program,** MCB 0653930. Telomere hypervariability in the model fungal pathogen, *Magnaporthe oryzae*. M. Farman (PI), 4/1/07 - 3/31/10, **$335,909** (nationally competitive).

Nicole Ward Gauthier

Date of Appointment: August 2, 2011 DOE: 93.5% Extension

RESEARCH

Projects, applied research

Bitter Rot of Apple: A Closer Look at the *Colletotrichum* spp. that Cause Disease, Time of Infection, Differences in Fungicide Sensitivities & Their Effect on Disease Management.

Seed Transmission of *Xylella fastidiosa*, Causal Agent of Bacterial Leaf Scorch in Oak

Survey of Rose Rosette Virus in Kentucky, Molecular Diagnosis, and Evaluation of Symptom Similarities with Abiotic Disorders

Proposals, funded

Bessin, R., W. Dunwell, C. Knott, P. Lucas, S. Saha, and **N. Ward Gauthier**. Kentucky IPM Extension and Implementation Program 2014-2017, co-PI. $195,000, $36,365 to Fruit IPM. (Crop Protection and Pest Management through National Institute of Food and Agriculture).

Bessin, R., W. Dunwell, C. Lee, P. Lucas, K. Seebold, and **N. Ward Gauthier**. Advancing IPM in Kentucky through Extension: 2012-2016, co-PI. $351,899, $44,092 to Fruit IPM. (Extension Integrated Pest Management Coordination and Support Program through National Institute of Food and Agriculture).

Ward Gauthier, N. A. 2013-2014. Solving Urban Tree Mysteries by Training Better Detectives, PI. $10,042 (Kentucky Division of Forestry, Urban and Community Forestry Grant Program).

Ward, N. A., PI. 2013-2015. Elucidating the Spread and Transmissibility of Blueberry Mosaic Virus, a New Disease of Blueberry, PI. $15,000 (Southern Sustainable Agriculture Research and Education On-Farm Grants).

Ward, N. A., PI. 2013-2014. Seed Transmission Risk Evaluation of *Xylella fastidiosa*, Causal Agent of Bacterial Leaf Scorch in Oak, PI. $2,500 (UK Nursery IPM Mini Grant Program).

Southern Nursery IPM Working Group, Sarah White, Clemson University, PI. 2013-2014. IPM for Shrubs in Southeastern U.S. Nursery Production (Vol. I), a SNIPM Working Group Effort. $29,983 (Southern Region IPM Center, IPM Enhancement Program). Collaborators: White, S.A., Fulcher, A., Chong, J.-H., LeBude, A., Adkins, C., Braman, K., Chappell, M., Derr, J., Dunwell, W., Frank, S., Hale, F., Klingeman, W., Knox, G., Neal, J., **Ward, N**., Windham, A., Williams-Woodward, J.

Proposals, submitted

Southern Nursery IPM working group, Amy Fulcher, University of Tennessee, PI. Using mobile technology, embedded network sensing, and improved predictive models to increase sustainability in perennial crop systems, co-PI. $9,212,797 (Submitted to Specialty Crops Research Initiative; 2012, not funded; resubmitted 2014, not funded). Coauthors: K. Braman, M. Chappell, J.-H. Chong, J. Derr, W. Dunwell, S. Frank, A. Fulcher, F. Hale, W. Klingeman, G. Knox, A. LeBude, J. Neal, M. Palma, M. Paret, R. Paragas, **N. Ward**, S. A. White, A. Windham, J. Williams-Woodward, and D. Woodward.

Graduate Student Advising

Misbahkul Munir, Master's degree in progress. Characterization of *Colletotrichum* Species Causing Bitter Rot of Apple in Kentucky Orchards, co-advisor.

Baker Aljawasim, Master's degree awarded May 2014. Evaluation of PCR Detection Methods for *Verticillium* in Woody Ornamentals, committee member.

EXTENSION ACTIVITIES

Workshops, Trainings, and Commodity Tours

Statewide or district workshops and trainings: 8 presentations in 2011; 23 in 2012; 30 in 2013, 17 in 2014. Examples include:

- Woody Plants and Urban Forestry Agent Training. 2014. Intense classroom and field walk, in-service workshop, held in 5 locations. Organized and developed training manuals & digital references. Collaborators: Lee Townsend & Bill Fountain. (Impact reported in 2014 success story)
- Multi-State Hands-On Nursery Pest Management Workshops. 2014. Held in 3 locations. Lead pathologist, developed all disease management training materials. Cooperating universities: Clemson, U of Florida, NC State, U of Tennessee, Virginia Tech.
- Commercial Blueberry Production in KY. Held in 1 location in 2013 and 2 locations in 2014. Full day production workshop. Organizer. Collaborators: Ric Bessin, John Strang, Win Dunwell.

County meetings: 2 meetings in 2011; 16 in 2012; 14 in 2013, 27 in 2014.
Field visits, primary diagnoses, and consultations: 42 in 2011; 74 in 2012; >100 in each 2013 & 2014.
Provided technical support to the Plant Disease Diagnostic Laboratory.

PUBLICATIONS

Refereed Publications

- **Gauthier, N. A**., Polashock, J., Thekke-Veetil, T., Martin, R. R., Beale, J. 2014. First report of blueberry mosaic disease caused by blueberry mosaic associated virus in Kentucky. Plant Disease (*submitted*).
- Fulcher, A., **Ward Gauthier, N**., Klingeman, W. E., Hale, F., White, S. A. 2014. Blueberry culture and pest, disease, and abiotic disorder management during nursery production in the Southeastern US: A review. Journal of Environmental Horticulture (*submitted*).
- Klingeman, W. E., White, S. A., LeBude, A., Fulcher, A., **Ward Gauthier, N.**, Hale, F. 2014. Arthropod pests, plant diseases, and abiotic disorders and their management on *Viburnum* species in the Southeastern US: A review. Journal of Environmental Horticulture 32(2):84-102.
- **Ward, N. A.**, Amsden, B. 2013. First report of QoI-resistance of *Plasmopara viticola* in grape in Kentucky. Plant Disease 98:276.
- **Ward Gauthier, N.**, Maruthachalam, K., Subbarao, K.V., Brown, M., Xiao, Y., Robertson, C L., Schneider, R.W. 2014. Mycoparasitism of *Phakopsora pachyrhizi*, the soybean rust pathogen, by *Simplicillium lanosoniveum.* Biological Control doi:10.1016/j.biocontrol.2014.05.008. *(in press, dissertation research).*
- **Ward, N. A.**, Robertson, C. L., Chanda, A. K., and Schneider, R. W. 2012. Effects of *Simplicillium lanosoniveum* on *Phakopsora pachyrhizi*, the soybean rust pathogen, and its use as a biological control agent. Phytopathology 102:749-760. *(dissertation research).*
- Chanda, A.K., **Gauthier, N.A.**, Robertson, C.L., Chen, Z.Y., Schneider, R.W. 2014. Development of a qPCR detection protocol for *Cercospora kikuchii* in soybean leaves and its use for documenting latent infection as affected by fungicide applications. Phytopathology 104(10): 1118-1124.

Online Extension Publications (eXtension)

Ward Gauthier, N., Koester, D., Tewksbury, F. 2013. Fruit, Orchard, and Vineyard Sanitation. Apples (regional resource link) and Blueberries (feature article) Communities of Practice (*adaptations from original Extension publication PPFS-GEN-05*).

Ward Gauthier, N., Sears, A. 2014. Managing Diseases without Fungicides – A Focus on Sanitation (Garden Professors series) Consumer Horticulture Community of Practice (*adaptations from original Extension publication PPFS-GEN-04)*

Extension Publications (Peer-Reviewed)

Extension publications published through AgCommunications as well as PPFS departmental series:
4 publications in 2011; 13 in 2012; 9 in 2013; 15 in 2014.
Examples include:

- Durham, R. E., Strang, J. G., **Ward, N. A.**, and Bessin, R. 2012 & 2013. Disease and Insect Control Programs for Homegrown Fruit in Kentucky (ID-21). 20 pp. (*minor revision*).
- **Ward Gauthier, N.**, Kaiser, C., Goodin, K., Williams, J. 2014. Stress and Decline in Woody Plants (ID-50). 11pp. (*major revision*). Agent collaborators on all new publications.
- **Ward, N. A**., Seebold, K. W. 2014. Homeowner's Guide to Fungicides (PPFS-GEN-07). 5pp. (*new publication 2013, revised 2014*). Agents consider this my most useful publication.
- Weinzierl, R., Babadoost, M., Lewis, D., Gleason, M. L., Bessin, R. T., Strang, J. G., Wright, S., **Ward, N. A.**, Welty, C., Ellis, Foster, R. E., Hirst, P. M., Weller, S. C., Beckerman, J., McManus, P. S. 2012. Midwest Tree Fruit Spray Guide (ID-92). 68 pp. (*major revisions 2012, 2013, and 2014 made annually, Midwest Fruit Workers*). This group also publishes a corresponding small fruit spray guide ID-94).

Other Extension Publications

Widely distributed Extension publications (fact sheets, worksheets, grower references) with high impact:
2 publications in 2011; 2 in 2012; 11 in 2013. Example:

- **Ward Gauthier, N.** 2014. Commercial Apple Fungicide Schedule Worksheet (PPFS-FR-T-19) and Effectiveness of Fungicides for Management of Apple Diseases (PPFS-FR-T-15). 5pp. (*compilations of sources, annual revisions).* Major components to IPM orchard trainings.

Books, book chapters, reviews, and proceedings

Adkins, C.R., S.K. Braman, M.R. Chappell, J.-H. Chong, J.F. Derr, W.C. Dunwell, S.D. Frank, A.F. Fulcher, F.A. Hale, W.E. Klingeman, G.W. Knox, A.V. LeBude, M.L. Paret, J.C. Neal, J.R. Sidebottom, **N.A. Ward**, S.A. White, J. L. Williams-Woodward, and A.S. Windham. 2012. IPM for Select Deciduous Trees in Southeastern US Nursery Production. Fulcher, AF, SA White, Eds. Knoxville, TN: Southern Nursery IPM Working Group. 323 pp. (co-authored Ch 4 Birch, Ch 5 Cherry, Ch10 Maple, Ch 11 Oak, Ch 12 Redbud).

Braman, S.K., M.R. Chappell, J.-H. Chong, J.F. Derr, W.C. Dunwell, A.F. Fulcher, F.A. Hale, W.E. Klingeman, G.W. Knox, A.V. LeBude, M.L. Paret, J.C. Neal, **N.A. Ward Gauthier**, S.A. White, J. L. Williams-Woodward, and A.S. Windham. 2012. IPM for Shrubs in Southeastern US Nursery Production. White, S.A. and W.E.Klingeman, Eds. Clemson, SC: Southern Nursery IPM Working Group. 175 pp. (co-authored Ch 4 Blueberry and Ch 5 Viburnum).

Barnes, T., Gao, G., Isaacs, R., Johnson, D., Smigell, C., Stafne, E., **Ward, N.**, Wolfe, D., Wright, S. 2012. Midwest Blueberry Production Guide. **Ward, N. A.**, Ed. (authored/co-authored Ch 1 Introduction to Blueberry Production, Ch 2 Blueberry Growth and Development, and Ch 11 Blueberry Diseases). (*hard-copy publication TBD, temporarily available online as ID-210*). **Blue Ribbon Extension Publication Award winner, 2014, Southern Region American Society of Horticulture Science.

OTHER DOCUMENTED ACCOMPLISHMENTS AND CONTRIBUTIONS

Popular Press

Articles, newsletters, magazines, newspaper: 17 articles in 2012; 12 in 2013, 5 in 2014
Examples include:

- Sanitation Practices: Critical Components for Disease Management. 2014. Texas Nursery and Landscape Green Newsletter
- The Clean Team: A Common Sense Approach to Nursery and Greenhouse Disease Management. 2014. Nursery Management Pro Magazine

Television interviews: 5 interviews in 2012, 7 in 2013, 3 in 2014

Websites and Mobile Apps

Plant Disease Prediction Models, UK AgWeather Center. 2012 & 2013. Updated and revised; developed educational tools for grower training. Collaboration with John Strang, Ric Bessin, Tom Priddy, Matt Dixon, and Wanhong Wang. (*available as a webpage and as a mobile application*)

Midwest Tree Fruit Spray Guide. 2014. New mobile application and adaptation of the tree fruit and small fruit spray guide series as "apps" formatted for phones and tablets. *(in progress, complete 2015).*

Social Media

Blogspot blog (created 9/1/2011): 48 posts, 51,105 page views
Facebook (created 11/1/2011): 768 likes, 40,883 site visitors in 2011/2012; 33,700 in 2013, 49,500 in 2014
Other social media outlets: Pinterest, Google +, Twitter

Videos

YouTube videos: 2 custom movies in 2012, 5 movies in 2013, 2 movies in 2014, 1 in progress

SERVICE & MEMBERSHIP

Current membership in Professional and Honorary Societies

American Phytopathological Society
Southern Division of the American Phytopathological Society
Kentucky Association of State Extension Professionals
Midwest Fruit Workers Working Group
Southern Nursery Integrated Pest Management Working Group (SR-IPM Bright Ideas Award winner 2014)

Committees, Elected Positions

Southern Division of the American Phytopathological Society – Vice President 2013, President-elect 2014.

Midwest Fruit Workers Working Group – Active member, contributor to fungicide portions of the Midwest Spray Guide Series, lead plant pathologist and spray guide co-editor 2014, editor of the new Midwest Blueberry Production Guide, organizer of the Midwest Fruit Workers grower survey and regional impact statement, and meeting coordinator for 2012 Midwest Fruit Workers Annual Meeting.

American Phytopathological Society – Committee for Diversity and Equality, chairperson 2012 and chair-elect 2011

American Phytopathological Society – Active member of the Leadership Institute Committee

American Phytopathological Society – Vice-chair for Career Advancement and Development Resource and Education

Committees, Advisory Boards

Extension Task Force on Scholarly Activity in Publishing. 2013 – 2014. Active participant, co-authored proposed guidelines with Janet Kurzynske. UK College of Agriculture.

Future Direction for Extension. 2014. Extension white paper focusing on future activities for the American Phytopathological Society. Co-authors Tom Allen, Marty Draper, Mohamed Khan.

Editorships, Review Panels, Reviewer Service

Review panel, North Central IPM Regional Grants Program, 2012 and 2013

Section Editor (tree fruit), Plant Disease Management Reports. Fall 2012 to present

Invited Lectures (multi-state/regional/national meetings)

Apps for Apple & Digital Technology in the Orchard. 2014. Annual meeting of the Midwest Fruit Workers.

Extension in the Digital Age & Social Media. 2013. Annual meeting of the Midwest Fruit Workers.

Sanitation: The Common Sense Approach to Disease Management in Greenhouse and Nursery Production. 2013. Texas Nursery and Landscape Association, Annual TNLA Expo

My First Year on the Job: Everything Your Graduate Advisor Will Forget to Tell You. 2013. Louisiana State University, Department of Plant Pathology.

PROFESSIONAL DEVELOPMENT

Professional Meetings Attended

American Phytopathological Society. 2014. Annual Meeting, Minneapolis, MN

Midwest Fruit Workers. 2014. Annual Meeting, Indianapolis, IN

Southern Division of the American Phytopathological Society. 2014. Annual Meeting, Dallas, TX

American Phytopathological Society. 2013. Annual Meeting, Austin, TX

Midwest Fruit Workers. 2013. Annual Meeting, Indianapolis, IN

Southern Division of the American Phytopathological Society. 2013. Annual Meeting, Baton Rouge, LA

In-service Training

Critical Thinking. 2014. University of Kentucky, Human Resources Training and Development.

Ornamental Coffee Hour. 2013 & 2014. Weekly video conference among Extension plant pathologists from land grant universities throughout the Southeast, updates and discussions of current issues.

Sampling Terms, Concepts, and Best Practices for Plant Pathologists. 2013. American Phytopathological Society, Epidemiology and Crop Loss Assessment Committee workshop.

Kentucky Association of State Extension Professionals. 2012 & 2013.

Leadership Training

Building Better Relationships – Leveraging Conflict as an Opportunity. 2014. American Phytopathological Society, Leadership Institute.

Developing the Leader Within You. 2014. Ten-week leadership training. University of Kentucky Human Resources, Experienced Leader Academy.

Success and Leadership. 2013 & 2014. Invitation-only. Monthly meetings, group consisting of professionals from various career avenues.

NARRATIVE: PROGRAM FOCUS & IMPACT

Fruit crops, ornamentals, and forest trees are specialty agricultural crops of both economic and aesthetic value in Kentucky. Their diseases are commonplace, resulting in losses for commercial growers, retailers, and homeowners. Since my appointment in 2011, I have worked to **1) become a critical resource for county Extension agents and growers for trainings, disease management programs, and plant disease diagnostics 2) create modern educational and outreach programs, and 3) conduct applied research and focused educational programs in apple fruit rots and fungicide resistance for commercial growers**. In order to meet these objectives, my program utilizes local resources and regional collaborators, and requires a willingness to step "out of the box."

In summary, I have established one major and 4 minor applied research programs; submitted 2 peer-reviewed articles and 3 peer-reviewed journal notes, coauthored 10 book chapters in 3 books; submitted 4 eXtension articles; coauthored 36 Extension numbered (CAFÉ and major departmental) publications; authored or coauthored 20 other Extension publications (departmental series, spray guides); produced 6 videos; collaborated in 3 regional projects; reached over 1M people through popular press articles and over 150,000 through social media. Most importantly, I have provided training at over 100 state, regional, and county meetings and made over 200 field visits, recommendations, and primary diagnoses. Other activities included review panels for regional granting agencies, reviewer for a national plant disease journal, leadership roles in a national organization, and attendance at 12 professional meetings. Below are some of the approaches I have used in the past three years.

Bitter Rot Disease of Apple can result in devastating fruit losses in KY, even when preventative fungicides are used. The disease is caused by two fungal species that each have **different fungicide sensitivities and different pathogenicities**. Growers in KY, therefore, require **customized disease management recommendations**. My applied research program combines **molecular diagnostics, population genetics, and field studies** to provide **research-based recommendations** for growers.

I currently lead the newly-formed **UK Fruit Integrated Pest Management (IPM) Working Group** as a means to better serve fruit growers in the state. Like other commodity groups, we will use this platform to more efficiently **develop collaborative research projects** and **coordinate outreach**. The group will also develop specialized educational programs in order **to assist growers in minimizing inputs while becoming more profitable**. UK Fruit IPM will produce a **tree fruit crop assessment and pest management strategic plan** in 2014-2015, which will include feedback from a **grower focus group**. Resulting data will be used to guide future activities and research. Collaborators include Ric Bessin, John Strang, Shawn Wright, Daniel Becker, and Patsy Wilson.

Collaboration with the Midwest Fruit Workers provides an opportunity for research and Extension faculty from **9 states** across the region to combine resources in order to provide growers with a comprehensive set of recommendations. The group represents 47,700 acres of fruit and almost $300 million in market value (2012 USDA Ag Census). One of the outputs of this group is a series of production and pest management guides. In fact, I was the **lead editor of the first edition of the Midwest Blueberry Production Guide**, which is currently published online and slated to become available as hardcopy (dependent upon funding). I am currently serving as co-editor and lead plant pathologist for the group-authored publications: **Midwest Tree Fruit Spray Guide ID-92** and **Midwest Small Fruit and Grape Spray Guide ID-94**, both of which are the **sole source of fungicide, insecticide, and herbicide recommendations** for fruit growers in KY and the Midwest.

The UK Weather Center project includes collaborations with Ric Bessin and John Strang, as well as staff at the UK Ag Weather Center, to provide growers with **predictive models for assessment of disease risk**. These prediction models serve as supplemental decision tools for growers. Recent updates include integration of **5-day weather forecasting to allow for more accurate disease prediction** and management decisions. The webpage is also available as a mobile application for field and orchard access.

Utilization of a wide range of outreach components, such as **traditional publications, social media, informational videos, and mobile apps**, helps me tie various programs together and provide growers with research-based information in a language that is easy to understand. My outreach program encompasses **both commercial growers and residential clientele** within my crop assignments (commercial orchards, "green" industry ornamentals, Christmas trees, forestry, consumer fruit and home landscapes).

One of my outreach priorities is to provide stakeholders with the most up-to-date **disease management recommendations**. During the past three years, I revised several publications and added a number of new ones to the **Extension publication** literature base. Most of these resulted from **current disease concerns or requests from grower groups, diagnosticians, or other specialists**. Because much of this information, such as fungicide recommendations, can change frequently, I chose to **publish the majority of this information in-house**. Thus, we are able to publish materials in a timely manner and update information more efficiently. Regardless of the nature of the information, **all publications are peer-reviewed** by a plant pathologist or other subject matter specialist.

Interaction with county agents always takes precedence as I plan and implement each component of my program. My policy is to **respond quickly to agent calls and emails**, making time each day to answer questions and provide support. Additionally, I have utilized field visits and disease consultations to interact with agents and provide **one-on-one training**. Horticulture and agriculture agents are important stakeholders in my Extension program, and I always look forward to providing them with research-based diagnoses and disease-management information. Since my appointment three years ago, I have **developed close working relationships** with many agents. Recently, I began inviting **agents to coauthor all new Extension publications**, and the results have been gratifying for all involved.

An **Agent Survey** gave me the opportunity to collect feedback regarding my Extension program. According to results, approximately **60% of agent time/efforts are spent on ornamental and fruit issues** (see appendix). This coincides with the 2013 PAC, which reported that 74% of agent contact hours are concentrated on consumer horticulture and 21% on commercial horticulture. In the survey, a total of 83 respondents gave me insight into **which publications were most useful and which methods of training were most beneficial**. Open-ended questions collected anonymous suggestions and comments. Thus, future projects will include **more hands-on agent trainings, home garden/landscape resources (including a webinar series), and digital diagnostic guides** (web/ app format)**.**

In conclusion, my program has evolved during the past years, gaining more focus as research projects are better defined and agent-specialist relationships strengthen. My role has also transformed within the department, as we are experiencing changes to our Extension team. During 2014, I quickly switched from the "new kid on the block" to "get-it-done leader" as one colleague transferred to an industry position, another traveled for sabbatical, and yet another prepared for upcoming retirement. Responsibilities not only included increased supervision of staff and diagnostic labs, but also resulted in disease management recommendations for additional crop inquiries/diagnoses. Despite these challenges, I look forward to my new colleagues, innovative programs and collaborations, and another exciting year in Extension.

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Goodin, Michael Maurice	Associate Professor of Plant Pathology
eRA COMMONS USER NAME (credential, e.g., agency login) UKRF0007	

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
Brock University, St. Catharines, Canada	B.S.	05/85	Biology/Chemistry
The Pennsylvania State University	Ph.D.	05/96	Plant Pathology
University of California, Berkeley	Postdoctoral	08/02	Plant Virology

A. Personal Statement

The Goodin laboratory has been at the forefront in the application of live-cell microscopy to investigate the cellular biology of plant-adapted rhabdoviruses, and related negative-strand RNA viruses, for more than 11 years. We have made many seminal contributions particularly regarding the mechanism of nuclear import of viral proteins, their modification of nuclear membranes and identification of host factors implicated in the cell-to-cell movement of these viruses. In order to support this research we have developed many resources including a high-resolution yeast two-hybrid library of *Nicotiana benthamiana*. Additionally we have constructed many plant marker lines that express fluorescent markers targeted to a variety of subcellular loci. We have also developed many vectors for the transient expression of fluorescent proteins in plant cells. New international collaborations focus primarily on the characterization of emerging viruses in coffee (*Coffea arabica*) in Brazil. Goodin received a Visiting Scholar Award from the Brazilian funding agency CAPES, which will support two visits to the Universidade Federal de Lavras (UFLA) per year to conduct teaching and research workshops, which will focus on viral diseases of coffee. During the summer of 2014, Goodin led a collaborative research team, composed of members from UFLA and the University of Kentucky, during a two-month field research project in Brazil to map the genetic diversity in Coffee ringspot virus (CoRSV). This ongoing research, collected virus-infected material from three coffee producing states in Brazil, with emphasis on the Minas Gerais region, where 50% of Brazilian coffee is produced. A summary of Goodin's collaborative research on CoRSV in Brazil was reported online recently, http://uknow.uky.edu/content/coffee-research-leads-successful-partnership-brazil

B. Positions and Honors

Positions and Employment

2002-2008 Assistant Professor, Department of Plant Pathology, University of Kentucky, KY
2008-present Associate Professor, Department of Plant Pathology, University of Kentucky, KY

Selected Editorial Service

2012-present Associate Editor, Annual Review of Virology
2012-present Associate Editor, Molecular Plant Pathology
2012- present Associate Editor, Frontiers in Virology
2011- present Associate Editor, Frontiers in Plant-Microbe Interactions

C. Selected Peer-reviewed Research Articles

Most relevant to the current application (since 2000)

Ramalho, T. O., Figueira, A.R., Sotero, A. J., Wang, R., Geraldino Duarte, P. S., Farman, M., Goodin, M. M. (2014) Characterization of *Coffee ringspot virus-Lavras: a model for an emerging threat to coffee production and quality. Virology* 464-465:385-396.

Ganesan, U., Bragg, J.N., Deng, M., Marr, S., Lee, M.Y., Qian, S., Shi, M., Kappel, J., Peters, C., Lee, Y., Goodin, M.M., Dietzgen, R.G., Li, Z., and Jackson, A.O. (2013) Construction of a Sonchus Yellow Net Virus minireplicon: a step toward reverse genetic analysis of plant negative-strand RNA viruses. J Virol. 87:10598-10611.

Gavin, A., Wang, R., Bandyopadhyay, A., and **Goodin, M**. (2012) The nucleocapsid protein of *Potato yellow dwarf virus*: protein interactions and nuclear import mediated by a non-canonical nuclear localization signal. **Front Plant Sci.** 2012;3:14.

Martin, K.M., Dietzgen, R.G., Wang, R., and **Goodin, M.M.** (2011) Lettuce necrotic yellows cytorhabdovirus protein localization and interaction map and comparison with nucleorhabdoviruses. **J. Gen. Virol**. 93:906-914.

Min, B-E., Martin, K., Wang, R., Tafelmeyer, P., Bridges, M. and **Goodin, M.** (2010) A host-factor interaction and localization map for a plant-adapted rhabdovirus implicates cytoplasm-tethered transcription activators in cell-to-cell movement. **Molecular Plant-Microbe Interactions** 23:1420-1432.

Bandyopadhyay, A., Kopperud, K., Anderson, G., Martin, K, and **Goodin M. M.** (2010) An integrated protein localization and interaction map for *Potato yellow dwarf virus*, type species of the genus *Nucleorhabdovirus.* **Virology** 402:61-71.

Martin, K., Kopperud, K., Chakrabarty, R., Banerjee, R., Brooks, R. and **Goodin, M.M.** (2009) Transient expression in *Nicotiana benthamiana* fluorescent marker lines provides enhanced definition of protein localization, movement and interactions in planta. **The Plant Journal** 59:150-162.

Ghosh, D., Brooks, R. E., Wang, R., Lesnaw, J. and **Goodin, M.M.** (2008) Cloning and subcelluar localization of the phosphoprotein and nucleocapsid proteins of *Potato yellow dwarf virus*, type species of the genus *Nucleorhabdovirus.* **Virus Research** 135:26-35.

Chakrabarty, R., Banerjee, R., Chung, S.M., Farman, M., Citovsky, V., Hogenhout, S.A., Tzfira, T. and **Goodin, M.M.** (2007) pSITE vectors for stable integration or transient expression of autofluorescent protein fusions in plants: Probing *Nicotiana benthamiana*-virus interactions. **Molecular Plant-Microbe Interactions** 20:740-750.

Goodin, M.M., Chakrabarty, R., Yelton, S., Martin, K., Clark, A. and Brooks, R. (2007) Membrane and protein dynamics in live plant nuclei infected with Sonchus yellow net virus, a plant-adapted rhabdovirus. **Journal of General Virology** 88:1810-1820.

Deng, M., Bragg, J.N., Ruzin, S., Schichnes, D., King, D., **Goodin, M.M.** and Jackson, A.O. (2007) Role of the sonchus yellow net virus N protein in formation of nuclear viroplasms. **Journal of Virology** 81:5362-5374.

Additional publications of importance to the field (since 2000)

1. Kormelink, R., Garcia, M.L., Goodin, M., Sasaya, T., Haenni, A.L. (2011) Negative-strand RNA viruses: the plant-infecting counterparts. Virus Res. 162:184-202.

3. Jackson, A.O., **Dietzgen, R.G**., Fang, R.-X., **Goodin, M.M**., Hogenhout, S., Deng, M. and Bragg, J.N. (2008) Plant Rhabdoviruses. *In*: Encyclopedia of Virology, BWJ Mahy and MHV van Regenmortel, eds, Third Edition, Vol. 4, pp. 187-196, Elsevier, Oxford, UK.

4. Goodin, M.M., Zaitlin, D., Naidu, R.A., and Lommel, S.A. (2008) *Nicotiana benthamiana*: its history and future as a model for plant-microbe interactions. **Molecular Plant-Microbe Interactions** 21:1015-1026

5. Goodin, M.M., Chakrabarty, R., Banerjee, R., Yelton, S., and DeBolt, S. (2007) Update on live-cell imaging in plant cells: New Gateways to discovery. **Plant Physiology** 145:1100-1109.

6. Goodin, M.M., Chakrabarty, R. and Yelton, S. (2006) Membrane and protein dynamics in virus-infected plant cells. *In;* Plant Virology Protocols, Volume 2 : From viral sequence to protein function. *Eds*. *G. Foster, Y. Hong, E. Johansen, and P. Nagy.* The Humana Press Inc., pp. 377-393.

D. Research Support

Ongoing Research Support

Agency: National Science Foundation (US). Role: **Michael Goodin** (PI), Antonia Figuiera (CoPI). Project Duration: 7/20/2013- 5/31/2015. Title: Population Structure of Coffee Ringspot Virus. Role: PI. Award: **US$58,057**

Agency: CAPES:Programa Ciência sem Fronteiras – Bolsa Pesquisador Visitante Especial Role: Antonia Figuiera (CoPI), **Michael Goodin** (CoPI). Project Duration: 13/12/2012-13/12/2016 Award: **R$111, 228.00**

Agency: National Science Foundation (US). Role: **Michael Goodin** (PI). Project Duration: 10/01/07-5/30/15 A Host Protein Interaction and Localization Map for a Plant Rhabdovirus Role: PI. Award: **US$500,000**

BIOGRAPHICAL SKETCH: Aardra Kachroo

EXPERTISE

Plant molecular biology, physiology and biochemistry; fatty acid/lipid signaling; plant-pathogen interactions; plant defense; signal transduction

PROFESSIONAL PREPARATION

Mumbai University, India	BS (Microbiology)	1991
M. S. University of Baroda, India	MS (Biotechnology)	1993
M. S. University of Baroda, India and Salk Institute, CA	PhD (Microbiology)	1999
Duke University, NC	DNA replication	1999-2000
Cornell University, NY	Plant self recognition	2000-2002

APPOINTMENTS

2012–present Associate Professor, Department of Plant Pathology, University of Kentucky
2006–2011 Assistant Professor, Department of Plant Pathology, University of Kentucky
2003–2006 Research Specialist, Department of Plant Pathology, University of Kentucky
2000–2002 Postdoctoral Associate, Department of Plant Biology, Cornell University
1999–2000 Postdoctoral Associate, Duke University Medical Centre, Duke University

RESEARCH

Program Goals

1. Characterizing soybean defense signaling pathways
   a) Mechanisms of pathogen effector recognition
   b) Overlap in signaling during plant interactions with microbial pathogens and rhizobia
2. Characterizing the roles of primary metabolic components in plant defense
   a) Glycerolipids and their precursors in plant defense
   b) Glycerolipid-mediated induction of systemic immunity in plants

Hatch Project

Dissecting defense signaling pathways in soybean and Arabidopsis 10/2012–9/2017

Multistate Research Projects

1. Soybean diseases, North Central Extension Research Activity (NCERA) 137, 10/2009–9/2016
2. Management strategies to control major soybean virus diseases in the North Central region, NCERA 200 10/2006–9/2015

EXTRAMURAL SUPPORT

CURRENT

1. PI-**Aardra Kachroo**, Co-PIs-Pradeep Kachroo, Jun-Young Lee. Examining the importance of dynamic trafficking in systemic acquired resistance. **National Science Foundation (NSF)** (9/1/15–8/30/18)
2. PI-**Aardra Kachroo**. Broadening host-specificity in soybean-rhizobia symbiosis. **Kentucky Soybean Promotion Board (KSPB)** (7/1/15–6/31/16)
3. PI-Pradeep Kachroo, Co-PI-**Aardra Kachroo**. Molecular and biochemical characterization of low oleate-induced defense signaling in plants. **NSF** (8/1/11–12/31/15)

4. PI-Pradeep Kachroo, Co-PIs-Lisa Vaillancourt, **Aardra Kachroo**. Glycerol metabolism and its role in biotrophy versus necrotrophy in an Arabidopsis/fungal hemibiotrophic interaction **NSF** (5/15/08–12/31/15)

SYNERGISTIC ACTIVITIES

- **Manuscript Review**: Proceedings of the National Academy of Science USA, PLoS Pathogens, Plant Journal, Plant Physiology, Molecular Plant Microbe Interactions, Plant Molecular Biology, Tree Physiology, Journal of General Virology, BMC Plant Biology, Frontiers in Plant Science, Current Plant Biology, Physiological and Molecular Plant Pathology, Planta, Physiologia Plantarum, Plant Methods, Molecular Plant Pathology, Journal of Experimental Botany, Plant Cell Reports, Biotechnology Progress.
- **Editorial Services**: Frontiers in Plant Science, review editor
- **Proposal Reviews**: Oklahoma Plant Science Research Program, United States Department of Agriculture, National Science Foundation, Israel Department of Agriculture, Binational Agriculture Research and Development fund (BARD), European Cooperation in Science and Technology (COST), Swiss National Science Foundation, Czech Science Foundation, Research Grants Council of Hong Kong.
- **Panel Review**: Oklahoma Plant Science Research Program, National Science Foundation.
- **Organized** the "Strategic Planning for Nematode Research" meeting in St. Louis MO, February 2011. The meeting, partly funded by the USB, focused on research strategies to address soybean loss from root knot and reniform nematodes, particularly in the southern United States. I was involved in planning, organizing and conducting this meeting as well as for drafting a white paper summarizing the outcomes.
- **Committees:** University of Kentucky Undergraduate Research Advisory Committee (2011–present), University of Kentucky Radiation Safety Committee (2014-present), Department of Plant Pathology Academic Program Committee, Department of Plant Pathology Faculty Merit Evaluation Commiittee (2009-2011).
- **Elected Positions:** University of Kentucky Agriculture Faculty Council (2015-present).
- **Advising**: Postdoctoral researchers-7; Visiting scholars-2; Graduate students-7; Undergraduate students-10; High School students-4; Graduate Advisory Committees-8
- **Mentoring**: Involved in mentoring underrepresented and disadvantaged undergraduate students via the University of Kentucky's AMSTEMM (Appalachian & Minority Science, Technology, Engineering & Mathematics majors), Kentucky Young Scientists Summer fellowship (KYSS), and Federal Work Study programs.
- **Outreach**: Conducted annual plant disease workshops for the Girl Scout's "Girls in Engineering, Math and Science" program targeting middle and high school girls (2013-present). Conducted annual plant molecular biology workshops and exhibits for middle and high school students at the Kentucky Youth Science Summit (2013-present). Conducted a workshop and laboratory tour on "Introduction to Plant Biology" for Lexington upper elementary and middle school students (2012, 2013). Made annual research presentations to Kentucky soybean & corn growers (2009-present).

- **Research Recognition**: Research related to light-mediated regulation of viral defense highlighted in *The Ag Magazine* (A College of Agriculture publication, Fall 2011, pg 23 *http://www.ca.uky.edu/agcomm/magazine/2011/FALL2011/Articles/researchreport2010.html*); Presentation at the 2011 annual American Phytopathological Society meeting mentioned in the *USB Weekly* (*A weekly newsletter distributed by the United Soybean Board*, August 2011); Plant systemic immunity-related research highlighted in the *Science Daily* (http://www.sciencedaily.com/releases/2011/03/110328101609 .htm); Bean pod mottle virus-related research featured in the *Soybean Sentinel* (A Kentucky Soybean Association magazine. Fall 2010, pg 16 http://www.kysoy.org/scoop/Fall%20Sentinel-proof2010.pdf); Young Women Investigator Travel Award by the American Society of Plant Biologists (2009).

BIOGRAPHICAL SKETCH **Pradeep Kachroo**

a. Expertise: Plant genetics, molecular biology and biochemistry; fatty acid/lipid signaling; host-pathogen interaction.

b. Professional Preparation

University of Delhi, India	Botany	B.S., 1987
M. S. University of Baroda, India	Biotechnology	M.S., 1989
M. S. University of Baroda, India, and University of Wisconsin, Madison	Microbiology	Ph.D., 1995
ETH-Honggerberg, Zurich, Switzerland and M. S. University of Baroda, India	Plant-pathogen interaction	1995-1997
Waksman Institute, Rutgers, NJ	Plant defense signaling	1997-2000
Boyce Thompson Institute, Cornell, NY	Plant defense signaling	2000-2002

c. Appointments

2013-present	Professor, University of Kentucky
2007-2013	Associate Professor, University of Kentucky
2002-2007	Assistant Professor, University of Kentucky

d. Publications (Selected from 64 peer-reviewed publications)

Most relevant to the current application

1. Gao Q-M, Yu K, Xia Y, Shine MB, Navarre D, Kachroo A, **Kachroo P.** (2014) Mono- and digalactosyldiacylglycerol function nonredundantly to regulate systemic acquired resistance in plants. **Cell Reports**, 9: 1681-1691. Paper highlighted in Chemistry and Biology (Milka, 21: 1597-1598)
2. Wendehenne D, Gao Q-M, Kachroo A, **Kachroo P.** (2014) Free radical-mediated systemic immunity in plants. **Curr. Opin. Plant Biol.** 20:127-134.
3. Wang C, El-Shetehy M, Shine MB, Yu K, Navarre D, Wendehenne D, Kachroo A, **Kachroo P.** (2014) Free radicals mediate systemic acquired resistance. **Cell Reports** 7:348-355**.** Paper highlighted in Global Medical Discovery.
4. Yu K, Soares J, Mandal MK, Wang C, Chanda B, Gifford AN, Fowler JS, Navarre D, Kachroo A, **Kachroo P.** (2013) A feed-back regulatory loop between glycerol-3-phosphate and lipid transfer proteins DIR1 and AZI1 mediates azelaic acid-induced systemic immunity. **Cell Reports** 3:1266-1278.
5. Chanda B, Xia Y, Mandal M, Yu K, Sekine K, Gao Q-M, Selote D, Hu Y, Stromberg A, Navarre D, Kachroo A, **Kachroo P.** (2011) Glycerol-3-phosphate, a critical mobile inducer of systemic immunity in Plants. **Nature Genetics** 43:421-427 (**Article**). Paper highlight by Faculty of 1000 Biology.
6. Xia Y, Gao Q-M, Yu K, Navarre, D, Hildebrand D, Kachroo A*, **Kachroo P.** (2009) An intact cuticle in distal tissues is essential for the induction of systemic acquired resistance in plants. **Cell Host & Microbe** 5:151-165.

Additional recent publications of importance to the field (in last four years)

1. Gao Q-M, Kachroo A, **Kachroo P**. (2014) Chemical inducers of systemic immunity in plants. **J. Exp. Bot.** 65:1849-1855.
2. Zhu S, Jeong R-D, Lim G-H, Yu K, Wang C, Chandra-Shekara AC, Navarre D, Klessig DF, Kachroo A, **Kachroo P** (2013) Double-stranded RNA-binding protein 4 of

the RNA silencing machinery mediates induced pathogen resistance in plants. **Cell Reports** 4: 1168-1184.

3. Mandal MK, Chandra-Shekara AC, Jeong R-D, Yu K, Zhu S, Chanda B, Navarre D, Kachroo A, **Kachroo P**. (2012) Oleic acid-dependent modulation of NITRIC OXIDE ASSOCIATED 1 protein levels regulates nitric oxide-mediated defense signaling in *Arabidopsis*. **Plant Cell** 24:1654-1674.
4. Zhu S, Jeong R-D, Venugopal SC, Lapchyk L, Navarre D, Kachroo A, **Kachroo P** (2011) Regulatory roles of SAG101 and redundant EDS1 isoforms in resistance protein-mediated signaling against Turnip Crinkle Virus. **PLoS Pathogens** 7:e1002318.
5. Jeong R-D, Chandra-Shekara AC, Barman S, Navarre D, Klessig D, Kachroo A, **Kachroo P** (2010) CRYPTOCHROME 2 and PHOTOTROPIN 2 regulate resistance protein mediated viral defense by negatively regulating an E3 ubiquitin ligase. **Proc. Natl. Acad. Sci. USA** 107:13538-13543.
6. Xia, Y., Yu, K., Navarre, D., Seebold, K., Kachroo, A., **Kachroo, P.** (2010) The *glabra1* mutation affects cuticle formation and plant responses to microbes. **Plant Physiology** 154: 833-846. **Highlighted paper.**

e. Synergistic Activities

- Section Editor- BMC Plant Biology, 2009 - present
- Co-Editor- Journal of Integrative Plant Biology, 2014 - present
- Section Editor- Current Opinion in Plant Biology (2013 issue on Host-pathogen interaction)
- Editor- Book on "Systemic signaling in plants"- Wiley-Blackwell Publishing
- Member Editorial Board- Plant Signaling and Behavior- 2005 - present
- Associate Editor- Molecular Plant-Microbe Interactions, 2009 – 2012
- President, Host-Resistance Committee, American Phytopathological Society, 2012 - 2013
- Grant and manuscript reviews: Manuscripts for Science, Nature, Nature Communications, the Plant Cell, the Plant Journal, PNAS, the EMBO Journal, MPMI, Plant Disease, Lipids, Molecular and Cell Biology of Lipids, Plant Physiology, Journal of Chromatographic Science, Journal of Physiology, Journal of General Virology, Phytochemistry, Tree Physiology, Plant Growth Regulators, Plant Molecular Biology and Molecular Plant-Microbe Interactions.
- Grant reviews for USDA-NRI, NSF, Ohio State University, UC Davis, Auburn University, Mississippi State University, University of Kentucky, BBSRC (United Kingdom), BARD (Canada-Israel), Netherlands Organization for Scientific Research.
- Involved with Kentucky Young Scientists Summer fellowship and Federal Work Study programs for minority and disadvantaged students.

f. Honors

- Noel Keen Award for Research Excellence in Molecular Plant Pathology, American Phytopathological Society, 2014
- Prestigious Paper Awards, University of Kentucky, 2007, 2010, 2014
- Faculty Futures Award, University of Kentucky, 2004

BIOGRAPHICAL SKETCH

NAME: **Peter D. Nagy**

eRA COMMONS USER NAME (credential, e.g., agency login): pdnagy2

POSITION TITLE: Professor

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	Completion Date MM/YYYY	FIELD OF STUDY
University of Keszthely, Hungary	BS/MS	05/1985	Plant Virology
Hungarian Academy of Sciences, Budapest	Ph. D.	06/1990	Plant Virology
Northern Illinois University	Postdoc	12/1995	Molecular virology
University of Massachusetts	Postdoc	12/1998	Molecular virology

A. Personal Statement

The goal of the proposed research project is to explore the pro-viral functions of co-opted ATP-generating glycolytic proteins in RNA viral replication. We are using a small plant RNA virus and an animal virus and we have developed yeast as a model host for these studies. The PI has also developed powerful cell-free assay capable of supporting full virus replication. The PI is doing a pioneering research in the area of virus-host interactions and he is capable of performing these experiments due to his extensive training in biochemistry, yeast genetics, virology and cell biology. He has published 145 papers (35 in the last three years) in the area of molecular virology and virus replication, recombination and host-virus interactions. Twelve complementary systems biology approaches performed in the PI's lab have led to the identification of ~500 host factors that are involved in RNA virus replication. Twenty of the identified host factors were further characterized in detail to dissect their functions in yeast and in the natural host. Several approaches have been developed that led to novel antiviral strategies. These advances validate the PI's approach to use yeast as a model host for these studies. ***The PI is in a unique position to dissect the mechanisms of co-opted host factors and antiviral proteins in virus replication based on the powerful yeast host and the authentic in vitro replication assays developed in his lab.***

B. Positions and Honors

Positions and Employment:

1985–1989 Graduate Research Assistant, Department of Plant Pathophysiology, Institute for Plant Protection, Hungarian Academy of Sciences, Budapest, Hungary; Advisor: Z. Kiraly.

1990–1995 Research Associate, Plant Molecular Biology Center and Department of Biological Sciences, Northern Illinois University, DeKalb. Research Advisor: Jozef Bujarski.

1996–1998 Research Associate, Department of Biochemistry and Molecular Biology, University of Massachusetts, Amherst. Research Advisor: Anne Simon.

1999–2003 Assistant Professor, Department of Plant Pathology, University of Kentucky

2003–2007 Associate Professor, Department of Plant Pathology, University of Kentucky

2007– Professor, Department of Plant Pathology, University of Kentucky

Scholarships, Fellowships and Honors:

1985–1988	Ph. D. fellowship from the Hungarian Academy of Sciences (nationally competitive)
1990	United Nations (UNIDO) postdoctoral fellowship,
2002	Science and Engineering Award from the Governor of Kentucky,
2000–	Associate Editor for Virology
2001–2004	ASV, Membership Committee
2002–2005	ASV, Program planning Committee
2004	Faculty Futures Award, University of Kentucky
2006	Bobby Pass Excellence in Grantsmanship Award
2007	Associate editor for Journal of Virology
2007	Thomas P. Cooper Research Award
2007	University Research Professor Award
2008	Ruth Allen Research Award, Phytopathology Society
2010	Associate Editor for PLoS Pathogens
2011	Section Editor for PLoS Pathogens
2013	Bobby Pass Excellence in Grantsmanship Award

C. Contribution to Science

1. ***Development of the TBSV-yeast system to study virus replication and virus-host interactions.*** I have developed yeast because of the *advantages of using yeast as a model host.* Since viruses are intracellular parasites that use the resources of eukaryotic cells, it is feasible to study virus replication in yeast (*S. cerevisiae*) cells. This makes the awesome power of yeast genetics, biochemistry and cell biology available for virus research. Another advantage is the knowledge on host proteins is the most comprehensive in yeast. In addition, the findings from yeast model host can then be validated in the native host as we have already shown for 20 host genes for TBSV. Altogether, *the available unique combination of tools* for tombusviruses, including development of the powerful yeast replication system by the PI, and a novel cell-free authentic tombusvirus replication assay, makes yeast as a truly outstanding model to provide accelerated progress and to facilitate exploratory research on virus - host interactions, which will be applicable to RNA viruses of plants and animals.

1. **Nagy, P. D., J. Pogany, and J. Y. Lin.** 2014. How yeast can be used as a genetic platform to explore virus-host interactions: from 'omics' to functional studies. Trends Microbiol **22:**309-316.
2. **Nagy, P. D., and J. Pogany.** 2006. Yeast as a model host to dissect functions of viral and host factors in tombusvirus replication. Virology **344:**211-20.
3. **Pogany, J., M. R. Fabian, K. A. White, and P. D. Nagy.** 2003. A replication silencer element in a plus-strand RNA virus. EMBO J **22:**5602-11.
4. **Panavas, T., and P. D. Nagy.** 2003. Yeast as a model host to study replication and recombination of defective interfering RNA of Tomato bushy stunt virus. Virology **314:**315-25.

2. **Genome-wide screens and global proteomics approaches to identify host factors affecting TBSV replication**. We have performed a dozen complementary genome-wide and global proteomics approaches that have led to the identification of ~500 host genes affecting TBSV replication in yeast. These screens are based on a yeast single-gene deletion library, over-expression library, temperature-sensitive (ts) yeast mutant library, yeast two-hybrid screen, and yeast protein arrays, making it the most complete screens among any virus-host

systems. Altogether, this research led to the identification of ~500 host proteins*, and* many genes have been identified in multiple screens, indicating that these host genes are important factors during TBSV replication. This systems biology approach makes TBSV-yeast system as one of the best characterized for virus-host interactions among any pathogens.

1. **Nagy, P. D., and J. Pogany.** 2012. The dependence of viral RNA replication on co-opted host factors. Nature Reviews Microbiology **10:**137-149.
2. **Pogany, J., J. Stork, Z. Li, and P. D. Nagy.** 2008. In vitro assembly of the Tomato bushy stunt virus replicase requires the host Heat shock protein 70. Proc Natl Acad Sci U S A **105:**19956-61.
3. **Serviene, E., N. Shapka, C. P. Cheng, T. Panavas, B. Phuangrat, J. Baker, and P. D. Nagy.** 2005. Genome-wide screen identifies host genes affecting viral RNA recombination. Proc Natl Acad Sci U S A **102:**10545-50.
4. **Panavas, T., E. Serviene, J. Brasher, and P. D. Nagy.** 2005. Yeast genome-wide screen reveals dissimilar sets of host genes affecting replication of RNA viruses. Proc Natl Acad Sci U S A **102:**7326-31.

3. **Characterization of co-opted host factors critical for TBSV replication**. We have characterized the detailed functions of more than 20 co-opted host proteins, which are involved in various viral processes, such as: Hsp70, elongation factor 1A and the ESCRT Vps4 AAA+ ATPase in the assembly of the viral replicase complex; eEF1A and eEF1Bgamma, DEAD-box RNA helicases and GAPDH in viral RNA synthesis. We have characterized Lipid transfer ORP proteins and VAP proteins in membrane contact site formation that is required for TBSV replication. These works revealed the complex and amazingly sophisticated interaction between TBSV and the host cells.

1. **Kovalev, N., and P. D. Nagy.** 2014. The Expanding Functions of Cellular Helicases: The Tombusvirus RNA Replication Enhancer Co-opts the Plant eIF4AIII-Like AtRH2 and the DDX5-Like AtRH5 DEAD-Box RNA Helicases to Promote Viral Asymmetric RNA Replication. PLoS Pathog **10:**e1004051.
2. **Barajas, D., K. Xu, I. F. de Castro Martin, Z. Sasvari, F. Brandizzi, C. Risco, and P. D. Nagy.** 2014. Co-opted Oxysterol-Binding ORP and VAP Proteins Channel Sterols to RNA Virus Replication Sites via Membrane Contact Sites. PLoS Pathog **10:**e1004388.
3. **Barajas, D., I. F. Martin, J. Pogany, C. Risco, and P. D. Nagy.** 2014. Noncanonical Role for the Host Vps4 AAA+ ATPase ESCRT Protein in the Formation of Tomato Bushy Stunt Virus Replicase. PLoS Pathog **10:**e1004087.
4. **Jaag, H. M., J. Pogany, and P. D. Nagy.** 2010. A host Ca2+/Mn2+ ion pump is a factor in the emergence of viral RNA recombinants. Cell Host Microbe **7:**74-81.

4. **Discovery of cell-intrinsic restriction factors against TBSV replication**. We have discovered 70 cell-intrinsic restriction factors (CIRFs), which inhibit TBSV replication. We have characterized cyclophilins, nucleolin, ribonucleases, WW-domain and TPR-domain containing proteins and co-chaperones as CIRFs. This should help opening up new antiviral approaches and our understanding antiviral responses of the host cell.

1. **Barajas, D., N. Kovalev, J. Qin, and P. D. Nagy.** 2015. Novel Mechanism of Regulation of Tomato Bushy Stunt Virus Replication by Cellular WW-Domain Proteins. J Virol **89:**2064-79.
2. **Sasvari, Z., P. Alatriste Gonzalez, and P. D. Nagy.** 2014. Tombusvirus-yeast interactions identify conserved cell-intrinsic viral restriction factors. Front Plant Sci **5:**383.
3. **Kovalev, N., and P. D. Nagy.** 2013. Cyclophilin a binds to the viral RNA and replication proteins, resulting in inhibition of tombusviral replicase assembly. J Virol **87:**13330-42.
4. **Lin, J. Y., V. Mendu, J. Pogany, J. Qin, and P. D. Nagy.** 2012. The TPR Domain in

the Host Cyp40-like Cyclophilin Binds to the Viral Replication Protein and Inhibits the Assembly of the Tombusviral Replicase. PLoS Pathog **8:**e1002491.

5. **Discovery of host factors regulating viral RNA recombination**. We have also discovered 100 host proteins that greatly affect viral RNA recombination, which is a driving force in virus evolution. The host enzymes includes cellular ion pumps, ribonucleases and DEAD-box helicases. TBSV is currently the only system, where viral RNA recombination factors are characterized at the system level and also mechanistically. This progress indicates well the elegance and power of an outstanding model system that can greatly help scientific progress.

1. **Prasanth, K. R., D. Barajas, and P. D. Nagy.** 2015. The Proteasomal Rpn11 Metalloprotease Suppresses Tombusvirus RNA Recombination and Promotes Viral Replication via Facilitating Assembly of the Viral Replicase Complex. J Virol **89:**2750-63.
2. **Nagy, P. D.** 2011. The roles of host factors in tombusvirus RNA recombination. Adv Virus Res **81:**63-84.
3. **Jaag, H. M., J. Pogany, and P. D. Nagy.** 2010. A host Ca2+/Mn2+ ion pump is a factor in the emergence of viral RNA recombinants. Cell Host Microbe **7:**74-81.
4. **Jaag, H. M., and P. D. Nagy.** 2010. The combined effect of environmental and host factors on the emergence of viral RNA recombinants. PLoS Pathog **6:**e1001156.

D. Research Support (last 3 years)

On-going:

1. **National Science Foundation (NSF)**. Title: Key role of the multifunctional translation elongation factor in virus replication. 01/15/12-12/31/15.

The goal of this project is to dissect the pro-viral function of eEF1A in TBSV replication. **Role: PI.**

2. **National Institute of Health (NIH/NIAID-R21).** Title: Mechanism of inhibition of RNA virus replication by host WW-domain proteins. Staring date: 04/01/14-03/31/16.
The goal of this project is to dissect the antiviral function of WW-domain-containing cellular proteins in TBSV replication. **Role: PI.**

Completed:

National Science Foundation (NSF). Title: The role of a host ion pump. 08/01/08-07/31/12. Role: PI. Effort: 1.2 month (10%).

National Institute of Health (NIH/NIAID-R21). Title: Functional role of a host metabolic enzyme in viral replication. Role: PI. Staring date: 02/13/09-01/31/11. Effort: 1.2 month (10%).

National Institute of Health (NIH/NIAID-R21). Title: The role of the host Ca/Mn pump in emergence of novel viral RNA recombinants. Role: PI. Effort: 1.2 month (10%). Staring date: 07/01/09-06/30/11.

National Institute of Health (NIH/NIAID-R21). Title: Roles of host RNA-binding proteins in virus replication. Role: PI. Effort: 1.2 month (10%). Staring date: 02/01/07-01/31/10.

Emily E. Pfeufer
205 Plant Sciences Building
University of Kentucky
Lexington, KY 40546
(859) 218-0721

EDUCATIONAL BACKGROUND

Doctor of Philosophy in Plant Pathology ..... August, 2014
The Pennsylvania State University, University Park, PA
Dissertation: Sources of inoculum, epidemiology, and integrated management of bacterial rots of onion (*Allium cepa*), with a focus on center rot of onion, caused by *Pantoea ananatis* and *P. agglomerans*

Master of Science in Plant Pathology ..... August, 2010
The Pennsylvania State University, University Park, PA
Thesis: Factors associated with resistance and cross-resistance to sterol demethylation-inhibiting fungicides in populations of *Venturia inaequalis*, the apple scab pathogen

Bachelor of Science in Biology, cum laude, minor in Environmental Writing ..... May, 2008
Allegheny College, Meadville, PA
Senior comprehensive project: Effects of the *Pseudomonas fluorescens* secondary metabolites 2,4-diacetylphloroglucinol and hydrogen cyanide on the auxin-inducible *GH3* promoter

PROFESSIONAL EXPERIENCE

Assistant Extension Professor, Department of Plant Pathology .....April, 2015 – present
University of Kentucky, Lexington, KY
Appointment: 80% extension, 20% research

Post-doctoral scholar, Dept. of Plant Pathology and Env. Micro .....August, 2014 – March, 2015
The Pennsylvania State University, University Park, PA

Graduate research assistant, Dept. of Plant Pathology and Env. Micro..... June, 2008 – July, 2014
The Pennsylvania State University, University Park, PA

Biological Science Aid, Fruit Lab ..... Summers, 2005-2007
USDA-PSI-ARS-Fruit Lab, Beltsville, MD

Laboratory assistant, Biology Department ..... Academic terms, 2005-2007
Allegheny College, Meadville, PA

SELECTED AWARDS AND HONORS

Travel award, Sahakian Family Endowment for Graduate Education in Agriculture ..... May, 2014
College of Agricultural Sciences, The Pennsylvania State University

Paul Hand Award for Graduate Student Teaching Achievement ..... March, 2014
College of Agricultural Sciences, The Pennsylvania State University

I.E. Melhus Graduate Student Symposium, American Phytopathological Society .....August, 2013
Annual Meeting in Austin, TX

Larry Jordan Endowment, Department of Plant Pathology and Env. Micro. ..... May, 2012
The Pennsylvania State University

Henry W. Popp Award, Department of Plant Pathology and Env. Micro. 2010, 2012
The Pennsylvania State University

PROFESSIONAL ACTIVITIES AND AFFILIATIONS

Plant Disease, Disease Notes Assigning editor ..... 2016 – 2018
Plant Health Progress Associate editor ..... 2015 - present
Plant Disease and Crop Protection, peer reviewer ..... 2014 - present

American Phytopathological Society, member ..... 2010 - present
APS Northeast Division, member ..... 2011 - present
APS Southern Division, member ..... 2015 - present
APS Extension Committee, member ..... 2010 - present

Gamma Sigma Delta Agricultural Honor Society, member ..... 2009 - present

Plant Pathology Association (Penn State), member ..... 2008 - 2015
Vice President / President ..... 2010 - 2011

EXTENSION PROGRAM SUMMARY

County visits with agents, growers, and/or industry representatives ..... April - September, 2015
Knox, Fayette, Todd, Muhlenberg, Hart, Garrard, Warren, Barren, Allen, Monroe, Metcalfe, Daviess, Russell, Lincoln, Lawrence, Laurel, Casey, Graves, Woodford, Christian, Clark, Harrison, Grayson, and Bell Counties, KY

University of Kentucky Cooperative Extension Contact Summaries ..... April – September, 2015
Tobacco production: 325 direct contacts, 4420 indirect contacts
Commercial horticulture: 352 direct contacts, 8309 indirect contacts
Home/consumer horticulture: 87 direct contacts, 18 indirect contacts
Staff development: 635 direct contacts, 205 indirect contacts
Total contacts across all categories: 1399 direct, 12,952 indirect

PUBLICATIONS

Refereed:

Ramos, L. S., Sinn, J. P., Lehman, B. L., Pfeufer, E. E., Peter, K. A., McNellis, T. W. 2015. An *Erwinia amylovora pyrC* mutant is auxotrophic for pyrimidine yet causes fire blight in apple tree shoots and grows in immature pear and apple fruit tissue. Letters in Applied Microbiology 60: 572 - 579.

Ramos, L. S., Lehman, B. L., Sinn, J. P., **Pfeufer, E. E.,** Halbrendt, N. O., McNellis, T. W. 2013. The fire blight pathogen *Erwinia amylovora* requires the *rpoN* gene for pathogenicity in apple. Molecular Plant Pathology 14: 838 – 843.

Pfeufer, E. E., Ngugi, H. K. 2012. Orchard factors associated with resistance and cross-resistance to sterol demethylation inhibitor fungicides in populations of *Venturia inaequalis* from Pennsylvania. Phytopathology 102: 272-282.

Brazelton, J., **Pfeufer, E. E.,** Sweat, T., McSpadden Gardener, B., Coenen, C. 2008. 2,4-diacetylphloroglucinol alters plant root development. Molecular Plant Microbe Interactions 21: 1349-1358.

Extension publications:

Kemble, J. M. (Senior editor), Lewis-Ivey, M. L., Quesada-Ocampo, L. M., Jennings, K. M., Walgenback, J. M. (Associate editors), and 55 others, including **Pfeufer, E**. 2016. Southeastern U.S. Vegetable Crop Handbook. In press.

Bessin, R. (editor), **Pfeufer, E.,** Seebold, K., Saha, S., Wright, S., Strang, J., 2016. 2016-2017 Vegetable Production Guide for Commercial Growers. University of Kentucky extension publication ID-36. In press.

PUBLICATIONS

Extension publications, cont.:

Pfeufer, E. E., Pearce, R. 2015. Maintaining the Efficacy of Foliar Fungicides for Tobacco Disease Management. University of Kentucky extension publication PPFS-AG-T-05. Single-peer review.

Pfeufer, E. E., Pearce, R. 2015. Fungicide Guide for Burley and Dark Tobacco. University of Kentucky extension publication PPFS-AG-T-8. Single-peer review.

Bulletins, conference proceedings, and project updates (nonrefereed):

Kentucky Pest News (weekly blog). **Pfeufer, E.** contributed 13 articles from April – September, 2015. Each article distributed via listserv, denoted in indirect contacts.

Saha, S., **Pfeufer, E**. Cucurbit downy mildew updates to ANR and Horticulture CES agents (direct emails). July – August, 2015.

Center for Crop Diversification monthly e-newsletter. **Pfeufer, E.** contributed 2 articles from April – September, 2015. Each article distributed via listserv, denoted in indirect contacts.

Gugino, B. K. and **Pfeufer, E. E.** 2015. Bacterial disease management for onions. Mid-Atlantic Fruit and Vegetable Conference proceedings.

Pfeufer, E. E., Hoepting, C. A., Gugino, B. K. 2015. Identification of the most important factors driving bacterial bulb rot of onion in New York and Pennsylvania and implications for management. Empire Expo Conference Proceedings.

Pfeufer, E. E., Gugino, B. K. 2013. Environmental and production factors associated with bacterial diseases of onion. Mid-Atlantic Fruit and Vegetable Conference proceedings.

Gugino, B. K., and **Pfeufer, E. E.** 2013. Evaluate the effects of inoculum pressure and onion maturity at harvest on harvest and post-harvest losses due to bacterial diseases. http://www.paveggies.org/research/2013/research-report-2013-18_onion-bacterial-diseases-gugino.pdf

Gugino, B. K., Stoltzfus, J., **Pfeufer, E. E.,** Mansfield, M. A. 2012. Final report to the Pennsylvania Vegetable Marketing and Research Program and Pennsylvania Vegetable Growers Association. "Evaluate the efficacy of alternative in-season management products and fertility treatments on yield and the development of onion bacterial diseases." http://www.paveggies.org/research-reports.php

Gugino, B. K., **Pfeufer, E. E.,** Stoltzfus, J., Mansfield, M. A. 2011. Final report to the Pennsylvania Vegetable Marketing and Research Program and Pennsylvania Vegetable Growers Association – Simply Sweet Onion Committee. "Evaluate roles of transplants and defense-inducing, growth-promoting and fertility treatments on yield and onion bacterial diseases." http://www.paveggies.org/research-reports.php

Ngugi, H. K., **Pfeufer, E. E.** 2011. Resistance to DMI (SI) fungicides in populations of *Venturia inaequalis*, the apple scab pathogen, from Pennsylvania apple orchards. Pennsylvania Fruit News Vol. 91 (1):22-27.

Ngugi, H. K., **Pfeufer, E. E.** 2010. Resistance to DMI (SI) fungicides in populations of *Venturia inaequalis*, the apple scab pathogen, from Pennsylvania apple orchards. Pennsylvania Fruit News Vol. 90(2):31-36.

Published abstracts (with role):

Ramos, L. Lehman, B., Sinn, J., **Pfeufer, E. E.,** Peter, K., McNellis, T. 2015. A thief in the blight: what can *Erwinia amylovora* bacteria steal from their host? Phytopathology. Oral presentation (statistics).

Pfeufer, E., Gugino, B. K. 2014. Visual rating of bacterial disease severity as a threshold to time sweet onion harvest. Phytopathology. Poster presentation (presenter).

PUBLICATIONS

Published abstracts (with role, cont.):

Gugino, B. K., Mansfield, M. A., **Pfeufer, E. E.** 2014. Bacterial rots of sweet onion in Pennsylvania: tracking sources of infection and targeting critical management points. Phytopathology. Oral presentation (contributor).

Pfeufer, E. E., Gugino, B. K. 2014. Influence of nitrogen fertility on bacterial rot incidence and overall yield of onion in Pennsylvania. Phytopathology S1.5. Oral presentation (presenter).

Ramos, L. Lehman, B., Sinn, J., **Pfeufer, E. E.,** Halbrendt, N., McNellis, T. 2014. The *rpoN* gene is essential for *Erwinia amylovora* bacterium to cause fire blight disease in apples trees. Phytopathology S1.5. Oral presentation (statistics).

Pfeufer, E. E., Mansfield, M. A., Gugino, B. K. 2013. Environmental and management factors associated with bacterial rots of onion in Pennsylvania. Phytopathology 103: 6.S2.173. I.E. Melhus Student Symposium oral presentation (presenter).

Pfeufer, E. E., Mansfield, M. A., Gugino, B. K. 2012. On-farm management factors associated with bacterial bulb rots of onion in Pennsylvania. Phytopathology 102: 7.S4.92. Poster presentation (presenter).

Pfeufer, E. E., Mansfield, M. A., Stoltzfus, J., Gugino, B. K. 2011. Identification of factors associated with bacterial diseases of onion: A case study of two Pennsylvania farms. Phytopathology 102: S1.7. Oral presentation (presenter).

Pfeufer E. E., Travis, J. W., Ngugi, H. K**.** 2010. Resistance to DMI fungicides in *Venturia inaequalis* from Pennsylvania. Phytopathology 100: 6.S100. Oral presentation (presenter).

INITIATED GRANTS

Saha, S. K., **Pfeufer, E.** "Effect of high tunnel tomato planting density on common foliar diseases and yield." Kentucky Department of Agriculture Specialty Crop Block Grant, submitted May, 2015.

Pfeufer, E. E., Gugino, B. K., Jimenez-Gasco, M. M. **"**Effects of weed hosts and extreme weather conditions on genotypic dynamics of *Pantoea agglomerans*, an emerging bacterial pathogen of onion." USDA-AFRI-NIFA Postdoctoral Fellowship program, submitted February, 2014.

May, S., Velez-Climent, M., Li, Y., Burgos, M., **Pfeufer, E. E.,** Conaway, S., McNellis, T. "Plant biology curriculum and training for high school educators." American Society of Plant Biologists Grant, submitted June, 2011.

Pfeufer, E. E., Gugino, B. K. "Copper alternatives for the management of bacterial diseases of onion." Northeast SARE Graduate Student Grant, submitted May, 2011.

Pfeufer, E. E., Gugino, B. K. "Copper alternatives in the management of bacterial diseases of onion." Penn State College of Agricultural Sciences Graduate Student Competitive Grant, submitted March, 2011.

PRESENTATIONS

Extension (UK presentation attendance included in extension contact summary):

Tobacco Twilight Tour, Murray State University, Murray, KY ..... August, 2015
"Points of control for tobacco diseases"

Tobacco industry field day, Woodford and Clark Counties, KY ..... August, 2015
Tobacco disease update

Corn-Soy-Tobacco Field Day, Princeton, KY ..... July, 2015
Tobacco disease update

Vegetable producer field walk, Lincoln Co., KY ..... July, 2015
Field walk outlining relevant diseases in cabbage, cantaloupe, bean, watermelon, and squash

PRESENTATIONS

Extension, cont:

Lync training for UK Agriculture and Natural Resources Agents..... June, 2015
"Managing tobacco blue mold in 2015: a proactive fungicide approach" (online training)

Farm-to-Fork at Fairview Auction, Christian Co., KY ..... June, 2015
Informal oral presentation about timber rot of tomato and damping off of vegetable transplants

Spring Horticulture Agents' Inservice, St. Catherine's College, KY ..... May, 2015
Hands-on workshop detailing vegetable diseases of timely interest

District 5 Agriculture and Natural Resources spring training, Russell Co., KY ..... May, 2015
Toured three high tunnels emphasizing disease management best practices

Empire State Producers' Expo, Syracuse, NY (invited speaker) ..... January, 2015
Presented "Identification of the most important factors driving bacterial bulb rot of onion in New York and Pennsylvania and implications for management"
Attendance: 50 growers, industry representatives, and extension educators

Master Gardeners' Education series, University Park, PA ..... 2013 - 2014
Presented "Plant disease management"
Attendance: 60 gardeners

Tri-County and New Holland Vegetable Growers Meetings, Shippensburg, PA ..... Winter, 2014
Presented "Integrated management of bacterial rots of onion and vegetable disease management: what you need to know for 2014"
Attendance: 150 growers, industry representatives, and extension educators

Lancaster County Vegetable Growers' Meeting, Leola, PA ..... March, 2013
Presented "Environmental and production factors associated with bacterial rots of onion"
Attendance: 80 onion growers

Mid-Atlantic Fruit and Vegetable Conference, Hershey, PA ..... January, 2013
Presented "Environmental and production factors associated with bacterial rots of onion"
Attendance: 100 onion growers

Commercial tree fruit producers, Adams Co., PA ..... 2008 - 2010
Approximately 200 contacts and 40 farm visits

Seminars:

Department of Plant Pathology, University of Kentucky .....October, 2014
Presented "Advances in integrated disease management through on-farm research, with case studies in onion and apple production systems"

Plant Pathology & Plant-Microbe Biology Section, School of Integrated Plant Science, Cornell University ..... August, 2014

Presented "Advances in integrated disease management through on-farm research, with case studies in onion and apple production systems"

Department of Plant Pathology and Env. Microbiology, The Pennsylvania State University .... June, 2014
Presented "Environmental and production variables influence bacterial rots of onion in pathogen- and symptom-specific ways" (Exit seminar).

Department of Plant Pathology, The Ohio State University ..... April, 2014
Presented "Identification of inoculum sources and management factors associated with bacterial rots of onion in PA and NY"

PRESENTATIONS

Seminars, cont.:

Department of Plant Pathology and Env. Microbiology, The Pennsylvania State University .... Nov., 2013
Presented "Integrated management of bacterial rots of onion in Pennsylvania"

Department of Plant Pathology, The Pennsylvania State University ..... June, 2010
Presented "Resistance to sterol-demethylation inhibiting fungicides in populations of *Venturia inaequalis*, the apple scab pathogen"

Department of Plant Pathology, The Pennsylvania State University..... March, 2009
Presented "Bacterial auxin manipulation and its effects on plant hosts"

Other professional presentations:

Delaware-Maryland-Virginia-Pennsylvania-New Jersey Plant Pathologists meeting..... Mar., 2012 & 2014
University of Delaware
Presented "Evolving recommendations for integrated management of bacterial rots of onion" and "Relationships between on-farm management and bacterial rots of onion"

TEACHING EXPERIENCE

PPA 640: Identification of Plant Diseases ..... August, 2015
Guest Lecturer with Jay Hettmansperger, Garrard Co. ANR agent: Vegetable Disease field trip Garrard and Lincoln Counties, KY

SAG 397: Apprenticeship in Sustainable Agriculture ..... July, 2015
Guest Lecturer: Plant Diseases and their Management, University of Kentucky

PPATH 405: Microbes and Plants ..... Fall, 2012 & 2013
Teaching Assistant and Lab Instructor, The Pennsylvania State University

AGECO 457: Integrated Pest Management ..... Fall, 2010
Teaching Assistant, The Pennsylvania State University

PPATH 405: Plant-Microbe Interactions ..... Fall, 2010
Supplemental laboratory assistant, The Pennsylvania State University

FSBIO 201: Investigative Approaches in Biology ..... Fall, 2006 & 2007
Teaching assistant, Allegheny College

SELECTED PROFESSIONAL SERVICE AND OUTREACH

Strategic Initiative, Chemical Management Team ..... July, 2015 – present
University of Kentucky Cooperative Extension Service, co-chair

Agriculture and Natural Resources 4-H Core Curriculum Workgroup ..... July, 2015 – present
University of Kentucky Extension, committee member

Social committee member, Dept. of Plant Pathology and Env. Micro. ..... Spring, 2009 – March 2015
The Pennsylvania State University

Session Moderator, APS Annual Meeting ..... 2013 - 2014
American Phytopathological Society, Minneapolis, MN

Department Head Search Committee, Dept. of Plant Pathology and Env. Micro. ...July, 2013 – June, 2014
The Pennsylvania State University

Ag Day, Dept. of Plant Pathology and Env. Micro. Booth ..... April 2011, 2012, 2013, 2014
The Pennsylvania State University

BIOGRAPHICAL SKETCH

NAME: **Christopher L. Schardl**	POSITION TITLE Professor and Chair, Department of Plant Pathology
eRA COMMONS USER NAME: chris.schardl	

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	MM/YY	FIELD OF STUDY
Cornell University, Ithaca, NY	B.S.	1974-1978	Biochemistry
University of California, Davis, CA	Ph.D.	1978-1983	Biochemistry
Plant Breeding Institute, Cambridge, England	Postdoctoral	1983-1985	Plant Molecular Biology

A. Personal Statement

My training is in biochemistry and molecular biology, and since 1987 I have led a research team on the molecular biology and genomics of symbiotic fungi in grasses (endophytes) that produce several classes of alkaloids, which in turn serve to protect the host plants from invertebrate and vertebrate herbivores. The particular emphasis of my program has been to elucidate the biosynthetic pathways of the endophyte alkaloids, particularly ergot alkaloids and loline alkaloids. This work has been a collaboration with Dr. Robert B. Grossman, whose group synthesizes putative pathway intermediates positionally labeled with heavy isotopes. Then, in my laboratory, we introduce the labeled compounds to cultures of *Epichloe* or *Neotyphodium* species—either wild-type or specific gene disruptants—to test hypothesized biosynthetic steps and the genes determining those steps. We conduct similar experiments *in planta*, whereby we establish stable symbioses of plants with the wild-type or mutant fungus, and feed the symbiotic plants with the compounds prepared in the Grossman laboratory to test their roles in the loline alkaloid pathway. This project has involved four Ph.D. students and two postdocs in my laboratory, and three postdocs and a graduate student in the Grossman lab. One of my students was a native of the Appalachian region, another was African-American, and both were the first in their families to obtain college degrees. Three of the five students and one of the postdocs who have worked on this project are female.

B. Positions and Honors

Assistant Professor of Plant Pathology, University of Kentucky, Lexington, 1985–1992
Associate Professor of Plant Pathology, University of Kentucky, Lexington, 1992–1997
Professor of Plant Pathology, University of Kentucky, Lexington, appointed 1 July 1997
Director, University of Kentucky Advanced Genetic Technologies Center, 2001–2011
Harry E. Wheeler Chair in Plant Mycology, University of Kentucky, Lexington, 2001–present
Chair, Department of Plant Pathology, University of Kentucky, appointed 1 July 2011

Experience and Professional Memberships (select)

Study Panels:
USDA NRI, 1995, 1999.
USDA IFAFS 2000.
NSF Major Research Instrumentation, 1999.

USDA Small Business Innovation Research, 2001.
NSF/ USDA NRI Joint Program, Microbial Genome Sequencing, 2007.
NSF, Plant Fungal and Microbial Developmental Mechanisms, 2008.
USDA / DOE Joint Program, Plant Feedstock Genomics for Bioenergy 2014

Editorial:

Associate Editor & Editorial Board Member, Mycologia, 1997-2003
Associate Editor & Editorial Board Member, Fungal Genetics & Biology, 2002–2011
Senior Editor, Molecular Plant-Microbe Interactions, 01/2007–12/2009
Executive Editor, Mycologia, 01/2014–present

Recognition:

McKnight Foundation Individual Award for Research in Plant Biology, 1989–1992.
Sigma Xi (inducted 1994)
Gamma Sigma Delta (inducted 1997)
Thomas Poe Cooper Award for Research in Agriculture, University of Kentucky, 1999
Gamma Sigma Delta George Mitchell, Jr. Award for Outstanding Service to Graduate Students, University of Kentucky, 2000
Fellow of the American Phytopathological Society, Awarded 2003
Fellow of the Mycological Society of America, Awarded 2004
University of Kentucky President's Award for Diversity, 2008

Other:

Co-organizer (with L.J. Vaillancourt), joint meeting of the Mycological Society of America and the International Symposium on Fungal Endophytes of Grasses, 26 June – 1 July 2010.

C. Selected Peer-reviewed Publications

1. Tsai HF, Liu JS, Staben C, Christensen MJ, Latch G, Siegel MR, Schardl CL (1994) Evolutionary diversification of fungal endophytes of tall fescue grass by hybridization with *Epichloë* species. *Proceedings of the National Academy of Sciences of the United States of America* **91:** 2542-2546.
2. Wilkinson HH, Siegel MR, Blankenship JD, Mallory AC, Bush LP, Schardl CL (2000) Contribution of fungal loline alkaloids to protection from aphids in a grass-endophyte mutualism. *Molecular Plant-Microbe Interactions* **13:** 1027-1033.
3. Panaccione DG, Johnson RD, Wang JH, Young CA, Damrongkool P, Scott B, Schardl CL (2001) Elimination of ergovaline from a grass-*Neotyphodium* endophyte symbiosis by genetic modification of the endophyte. *Proceedings of the National Academy of Sciences of the United States of America* **98:** 12820-12825.
4. Schardl CL, Leuchtmann A, Spiering MJ (2004) Symbioses of grasses with seedborne fungal endophytes. *Annual Review of Plant Biology* **55:** 315-340. doi 10.1146/annurev.arplant.55.031903.141735
5. Wang J, Machado C, Panaccione DG, Tsai H-F, Schardl CL (2004) The determinant step in ergot alkaloid biosynthesis by an endophyte of perennial ryegrass. *Fungal Genetics and Biology* **41:** 189-198. doi 10.1016/j.fgb.2003.10.002
6. Spiering MJ, Moon CD, Wilkinson HH, Schardl CL (2005) Gene clusters for insecticidal loline alkaloids in the grass-endophytic fungus *Neotyphodium uncinatum*. *Genetics* **169:** 1403-1414. doi 10.1534/genetics.104.035972
7. Faulkner JR, Hussaini SR, Blankenship JD, Pal S, Branan BM, Grossman RB, Schardl CL (2006) On the sequence of bond formation in loline alkaloid biosynthesis. *Chembiochem* **7:** 1078-1088.
8. Schardl CL, Panaccione DG, Tudzynski P (2006) Ergot alkaloids--biology and molecular biology. *Alkaloids: Chemistry and Biology* **63:** 45-86. doi 10.1016/S1099-4831(06)63002-2

9. Schardl CL, Grossman RB, Nagabhyru P, Faulkner JR, Mallik UP (2007) Loline alkaloids: currencies of mutualism. Phytochemistry **68:** 980-996. doi 10.1016/j.phytochem.2007.01.010
10. Schardl CL, Craven KD, Speakman S, Stromberg A, Lindstrom A, Yoshida R (2008) A novel test for host-symbiont codivergence indicates ancient origin of fungal endophytes in grasses. *Systematic Biology* **57:** 483-498. doi 10.1080/10635150802172184
11. Florea S, Andreeva K, Machado C, Mirabito PM, Schardl CL (2009) Elimination of marker genes from transformed filamentous fungi by unselected transient transfection with a Cre-expressing plasmid. Fungal Genetics and Biology **46:** 721-730. doi 10.1016/j.fgb.2009.06.010
12. Zhang D-X, Nagabhyru P, Schardl CL (2009) Regulation of a chemical defense against herbivory produced by symbiotic fungi in grass plants. *Plant Physiology* **150:** 1072-1082. doi 10.1104/pp.109.138222
13. Nagabhyru P, Dinkins RD, Wood CL, Bacon CW, Schardl CL (2013) Tall fescue endophyte effects on tolerance to water-deficit stress. *BMC Plant Biology* **13:** 127. doi 10.1186/1471-2229-13-127
14. Schardl CL, Florea S, Pan J, Nagabhyru P, Bec S, Calie PJ (2013) The epichloae: alkaloid diversity and roles in symbiosis with grasses. *Current Opinion in Plant Biology* **16:** 480-488. doi 10.1016/j.pbi.2013.06.012
15. Schardl CL, Young CA, Hesse U, Amyotte SG, Andreeva K, Calie PJ, Fleetwood DJ, Haws DC, Moore N, Oeser B, Panaccione DG, Schweri KK, Voisey CR, Farman ML, Jaromczyk JW, Roe BA, O'Sullivan DM, Scott B, Tudzynski P, An Z, Arnaoudova EG, Bullock CT, Charlton ND, Chen L, Cox M, Dinkins RD, Florea S, Glenn AE, Gordon A, Güldener U, Harris DR, Hollin W, Jaromczyk J, Johnson RD, Khan AK, Leistner E, Leuchtmann A, Li C, Liu J, Liu J, Liu M, Mace W, Machado C, Nagabhyru P, Pan J, Schmid J, Sugawara K, Steiner U, Takach J, Tanaka E, Webb JS, Wilson EV, Wiseman JL, Yoshida R, Zeng Z (2013) Plant-symbiotic fungi as chemical engineers: multi-genome analysis of the Clavicipitaceae reveals dynamics of alkaloid loci. *PLoS Genetics* **9:** e1003323. doi 10.1371/journal.pgen.1003323
16. Pan J, Bhardwaj M, Faulkner JR, Nagabhyru P, Charlton ND, Higashi RM, Miller A-F, Young CA, Grossman RB, Schardl CL (2014) Ether bridge formation in loline alkaloid biosynthesis. *Phytochemistry* **98:** 60-68. doi 10.1016/j.phytochem.2013.11.015
17. Schardl CL, Young CA, Moore N, Krom N, Dupont P-Y, Pan J, Florea S, Webb JS, Jaromczyk J, Jaromczyk JW, Cox MP, Farman ML (2014) Genomes of plant-associated Clavicipitaceae. *Advances in Botanical Research* **70:** 291-327. doi 10.1016/B978-0-12-397940-7.00010-0
18. Weyenberg G, Huggins PM, Schardl CL, Howe DK, Yoshida R (2014) kdetrees: non-parametric estimation of phylogenetic tree distributions. *Bioinformatics* **30:** 2280-2287. doi 10.1093/bioinformatics/btu258

D. Research Support

Ongoing Research Projects:

Pennsylvania St. Univ., subcontract for NIH/NIGMS R01GM113106-01A1 R.B. Grossman (PI)
09/01/2015–08/31/2018
Oxacycle production by 2-oxoglutarate oxygenases in natural product biosynthesis."
Role: Co-PI; Responsible to provide DNA sequences for relevant alkaloid biosynthesis genes.

Kentucky Science and Engineering Foundation KSEF-3327-RDE-018 C.L. Schardl (PI)
07/01/2015–06/30/2016
Remodeling alkaloid architecture in forage grass endophytes.
Replacement of genes for mammalian toxins with specific insecticidal alkaloids.

USDA-AFRI 2012-67013-19384 D.G. Panaccione (PI)
04/01/12-03/31/16
Alteration of alkaloid profiles of forage and turf grasses by genetic manipulation of endophytic fungi.
Role: Co-PI, Responsible for generating and testing several gene knockouts to elucidate pathway and genetics for loline and ergot alkaloids produced by symbiotic *Epichloe* and *Neotyphodium* species, fungal endophytes of grasses.

USDA-ARS 201307022058 C.L. Schardl (PI)
05/31/13-04/30/17
Effects of endophyte on survival and regrowth of tall fescue after drought stress.
Examining how different strains of *Epichloë coenophiala (=Neotyphodium coenophialum)*, a mutualistic endophyte of the grass, tall fescue, contribute to enhanced survival and growth of the plant.

Completed Research Projects:

USDA-NRI 2008-35318-04549 Panaccione (PI) 09/01/09-08/31/12
Biochemical and genetic basis for ergot alkaloid diversification.
Role: Co-PI
Responsible for generating and testing several gene knockouts to elucidate pathway and genetics for ergot alkaloids produced by symbiotic *Epichloe* and *Neotyphodium* species of fungi.

Kentucky Science and Technology Co., Inc. KSEF-148-502-09-247 Schardl (PI) 07/01/09-06/30/11
Development and deployment of a non-toxic endophyte in tall fescue for forage.
Role: PI
Modifying endophyte to eliminating production of complex ergot alkaloids involved in livestock toxicosis.

USDA-ARS 200911131030 Schardl (PI) 11/01/09-04/30/13
Plant and Endophyte Gene Expression and Metabolism in Response to Stress and Parasitism.
Role: PI
Examining how stresses and fungal endophytes influence levels of sugars, amino acids and growth regulators, and associated plant and fungus gene expression.

USDA-NIFA 2010-34457-21269 Schardl (PI) 09/01/10-08/31/13
Advanced genetic technologies, KY.
Role: PI
Equipment and support staff for a genomics core facility on the University of Kentucky campus.

Equipment and support staff for a genomics core facility on the University of Kentucky campus.
USDA-CSREES 2009-34457-20125 Schardl (PI) 09/01/09-08/31/12

Advanced genetic technologies, KY.
Role: PI
Equipment and support staff for a genomics core facility on the University of Kentucky campus.

USDA-CSREES 2008-34457-19176 Schardl (PI) 09/01/08-08/31/11
Advanced genetic technologies, KY.
Role: PI
Equipment and support staff for a genomics / bioinformatics core facility on the University of Kentucky campus.

NIH/NIGMS R01GM086888 Yoshida (PI) 07/31/08-06/30/13
Geometry of gene cophylogenies as relates to genome evolution and speciation.
Role: Co-I
Providing input from a biological perspective on the development of novel methods to evaluate relationships among gene phylogenies.

USDA-NIFA 2009-65109-05918 Howe (PI) 09/01/09-08/31/12
Genome sequence for the apicomplexan *Sarcocystis neurona.*
Role: Co-PI
Through managing the genomics / bioinformatics core facility, assisted in genome sequencing of *S. neurona*.

CURRICULUM VITAE

LISA J. VAILLANCOURT

Education

Ph.D. in Plant Pathology, Purdue University, West Lafayette, IN**,** 1991
M.S. in Plant Pathology, University of Illinois, Urbana-Champaign, IL, 1987
B.S. in Biology, University of Connecticut, Storrs, CT, *cum laude*, 1984

Employment

Full Professor, University of Kentucky, Department of Plant Pathology (July 2009-present).
Associate Professor, University of Kentucky, Department of Plant Pathology (July 1, 2002-June 2009).
Assistant Professor, University of Kentucky, Department of Plant Pathology (August 1, 1996-June 30 2002).
Postdoctoral Research Fellow, University of Vermont, Microbiology and Molecular Genetics, (August, 1991-July, 1996).
Graduate Research Assistant, Purdue University, Department of Botany and Plant Pathology, (August, 1988-July, 1991).
Plant Disease Diagnostician, University of Illinois Plant Disease Clinic, (Spring & Summer, 1987).
Graduate Research Assistant, University of Illinois, Department of Plant Pathology, (August 1984-July, 1988).

Current Teaching Activities

Fungal Biology, graduate level 3 credit lecture course, Instructor.
Physiology of Plant Health and Disease, graduate level 3 credit lecture course, Co-Instructor.

Awards

Bobby Pass Excellence in Grantsmanship Award, University of Kentucky College of Agriculture, 2010
George E. Mitchell Jr. Outstanding Faculty Award, for outstanding service to graduate students, Gamma Sigma Delta, 2007.

Selected Professional Activities

Associate Editor, Fungal Genetics and Biology, 2010-present
Associate Editor, Molecular Plant Pathology, 2014-present
Involved with two campus programs for minority and disadvantaged students: the UK Summer Fellowship program and the Kentucky Young Scientists Summer fellowship program (KYSS).

Refereed Articles past 10 years only. Names underlined, members of the Vaillancourt laboratory. Asterisk, corresponding author. (Total refereed publications, 39: including 5 book chapters).

1. Bec, S., Ward, T., Farman, M., O'Donnell, K., Hershman, D., Van Sanford, D., and **Vaillancourt, L.J.*** 2014. Characterization of *Fusarium* strains recovered from wheat with symptoms of head blight in Kentucky. **Plant Disease**, First Look (doi: http://dx.doi.org/10.1094/PDIS-06-14-0610-RE)

2. Torres, M.F., Cuadros, D.F., **Vaillancourt, L.J***. 2014. Evidence for a diffusible factor that induces susceptibility in the *Colletotrichum*–maize disease interaction. **Molecular Plant Pathology** 15.1: 80-93.
3. Barcelos, Q.L., Pinto, J.M.A., **Vaillancourt, L.J.***, Souza, E.A*. 2014. Characterization of *Glomerella* strains recovered from anthracnose lesions on common bean plants in Brazil. **PLoS ONE** 9(3): e90910. doi: 10.1371/journal.pone.0090910
4. O'Connell, R.J.*, Thon, M., Hacquard, S., Amyotte, S.G., Kleeman, J., Torres, M.F., Damm, U., Buiate, E.A., …and **Vaillancourt, L.J.*** 2012. Lifestyle transitions in the plant pathogenic *Colletotrichum* fungi deciphered by genome and transcriptome analyses. **Nature Genetics** 44: 1060-1065
5. Sharma, B., Nokes, S., Montross, M., and **Vaillancourt, L.J**.* 2011. A real-time polymerase chain reaction protocol for quantifying growth of *Fusarium graminearum* during solid substrate cultivation on corn stover. **J. Biotech. Res.** 2:144-155
6. Buiate, E.A.S., de Souza, E.A, **Vaillancourt, L.,** Resende, I., Klink, U.P.* 2010. Evaluation of resistance in sorghum genotypes to the causal agent of anthracnose. **Crop Breeding and Applied Biotechnology** 10: 166-172
7. Venugopal, S.C., Chanda, B., **Vaillancourt, L.**, Kachroo, A., and Kachroo, P*. 2009. The common metabolite glycerol-3-phosphate is a novel regulator of plant defense signaling. **Plant Signaling and Behavior** 4:8, 746-749
8. Hartman J.R.*, **Vaillancourt, L.J.,** Flowers, J.L., and Bateman, A.M. 2009. Managing Diplodia tip blight of landscape Austrian pines. **Arboriculture and Urban Forestry** 35(1): 27-32
9. Chanda, B., Venugopal, S., Kulshrestha, S., Navarre, D., Downie, B., **Vaillancourt, L.,** Kachroo, A., and Kachroo P.* 2008. Glycerol-3-phosphate levels are associated with basal resistance to the hemibiotrophic fungus *Colletotrichum higginsianum* in Arabidopsis. **Plant Physiology**. 147: 2017-2029
10. Venard, C., Kulshrestha, S., Sweigard, J., Nuckles, E., and **Vaillancourt, L.*** 2008. The role of a FadA orthologue in the growth and development of *Colletotrichum graminicola in vitro* and *in planta*. **Fungal Genetics and Biology** 45: 973-983
11. Venard, C., and **Vaillancourt, L.***. 2007. Penetration and colonization of unwounded maize tissue by the maize anthracnose pathogen *Colletotrichum graminicola* and the related nonpathogen *C. sublineolum*. **Mycologia** 99: 368-377.
12. Venard, C., and **Vaillancourt, L.*.** 2007. Colonization of fiber cells by *Colletotrichum graminicola* in wounded maize stalks. **Phytopathology** 97: 438-447
13. Flowers, J.L., Hartman, J.R., and **Vaillancourt, L.J.*** 2006. Histology of *Diplodia pinea* in diseased and latently infected *Pinus nigra* shoots. **Forest Pathology** 36: 447-459 .
14. Flowers, J.L., and **Vaillancourt, L.J.*** 2005. Parameters affecting the efficiency of *Agrobacterium tumefaciens*-mediated transformation of *Colletotrichum graminicola*. **Current Genetics** 48: 380-388.
15. Du, M., Schardl, C.L., Nuckles, E.M., and **Vaillancourt L.J.*** 2005. Using mating-type gene sequences for improved phylogenetic resolution of *Colletotrichum* species complexes. **Mycologia** 97: 641-658

PAUL VINCELLI
Department of Plant Pathology
University of Kentucky

EDUCATION

Ph.D. Plant Pathology, Cornell University, 1988
M.S. Plant Pathology, Rutgers University, 1983
B.A. Botany, Rutgers University, 1981

PROFESSIONAL EXPERIENCE

U.S. Fulbright Scholar to Nicaragua, Jan-Aug 2014
U.S. Fulbright Specialist in Agriculture to Uruguay, May 2013
Extension Professor (since 2001) and Provost's Distinguished Service Professor (since 2007), University of Kentucky, Lexington, KY
U.S. Fulbright Scholar to Uruguay, May-Aug 2005
Visiting Associate Professor, University of Wisconsin, May-Oct 1998
Associate Extension Professor, University of Kentucky, Lexington, KY. 1995-2001
Assistant Extension Professor, University of Kentucky, Lexington, KY. 1990-1995
Extension Plant Pathologist and Assistant Professor, University of Wyoming, Laramie 1988-1990
Instructor, Cornell University, Ithaca, NY, 1988
Graduate Assistant, Cornell University, Ithaca, NY, 1983-1987
Graduate Assistant, Rutgers University, New Brunswick, NJ, 1981-1983
Botanist, U.S. Peace Corps, Colombia and Nicaragua, 1977-1980

TEACHING

Selected Courses (*in Spanish)

Advanced Concepts in Sustainable Crop Production and Disease Management, Insights from Nicaragua (4 cr), University of Kentucky Education Abroad, Spring 2015
Fungicides, Advanced Concepts (3 cr), University of Kentucky, Fall 2014
*Fungicides, Advanced Concepts, National Agrarian University, Nicaragua, 2014
Principles of Plant Pathology, PPA400G (3 cr), University of Kentucky, since 1996
*Advanced Concepts in Fungicide Resistance, University of the Republic, Uruguay (Fulbright-funded course offering, co-instructor Pedro Modino), May 2013
Plant Disease, Population Biology, and Biotechnology (1 cr), University of Kentucky, co-taught with M. Goodin, since 2007.
Epidemiology and Management of Plant Disease, PPA695 (3 cr.), University of Kentucky, 1994, 1997, 1999, 2001, & 2003.
Clinical Plant Pathology (2 cr), University of Wyoming. 1988-89.
Plant Disease Control (3 cr), Cornell University. 1988.

Service on Graduate Committees

Two as major professor
Nineteen as committee member

SELECTED RESEARCH PAPERS

Published a career total of 41 refereed research papers and notes, and well over 200 research reports in *Plant Disease Management Reports* (or *B&C* and *F&N Tests*).

Aljawasim, B. and **Vincelli, P.** 2015. Evaluation of Polymerase Chain Reaction (PCR)-Based Methods for Rapid, Accurate Detection and Monitoring of *Verticillium dahliae*. Plant Dis. 99:866-873.

Vincelli, P. and Lee, C. 2014. Influence of open alleys in field trials assessing yield effects of fungicides in corn. Plant Disease 99:263-266.

Vincelli, P., and Amsden, B. 2013. Comparison of tissue-disruption methods for PCR-based detection of plant pathogens. Plant Dis. 97:363-368.

Caudle, J.R., Coolong, T., Williams, M.A., **Vincelli, P**. and Bessin, R. 2013. Development of an organic muskmelon production system against bacterial wilt disease. Acta Hort. (ISHS) 1001:249-254. http://www.actahort.org/books/1001/1001_27.htm

Vincelli, P. and Humble, J. 2013. Climate change Extension, presenting the science is necessary but insufficient. The International Journal of Climate Change: Impacts and Responses. Vol. 4, No. 4, pp. 109-116.

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REEREED TEACHING PUBLICATIONS

Vincelli, P. 2005. An inquiry-based approach to teaching disease cycles. *The Plant Health Instructor.* DOI:10.1094/PHI-T-2005-0222-01.

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Vincelli, P., and Heist, P. 2002. Student reaction to review sessions modeled after the DeBary Bowl. *The Plant Health Instructor*. DOI: 10.1094/PHI-T-2002-0303-01.

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OTHER PUBLICATIONS, MATERIALS, AND ACTIVITIES

- Over 400 in-State Extension Presentations
- Over 1000 newsletter articles
- Over 135 news releases
- Over 350 TV/radio recordings and interviews
- Over 50 Extension publications through UK Agricultural Communications
- Over 30 peer-reviewed departmental Extension fact sheets
- Over 25 proceedings of meetings
- Two invited book chapters
- Two published symposium contributions
- Workshops offered on DNA-based detection of plant pathogens in Lexington (10 times) , Mexico (four times), Nicaragua, and Barbados
- Other commodity-based workshops on disease identification and management throughout Kentucky
- PI on nearly one million dollars in Extension, research, and teaching grants

SELECTED INVITED PRESENTATIONS (Career total of 155) *(*=delivered in Spanish)*

"QoI (Strobilurin) Fungicides: Benefits and Risks for Agroecosystems," Brazilian Congress of Plant Pathology, 10 Aug 2015, Sao Paulo

"Genetically Engineered (GMO) Crops and Sustainability," Seminar, Shanghai University, 18 Jun 2015

*"A Perspective on Agroecology and GMOs", Campus-Wide for National Agrarian University, Managua, Nicaragua, 1 Jul 2014

*"A Perspective on Sustainability, Agroecology, and GMOs", University of Costa Rica *Graduate Seminar Series*, San Jose, 2 June 1014

"Climate Change and Crop Production", Keynote Presentation, Mexican Congress of Plant Pathology, Huatulco, MX, 22-25 Jul 2013

*"Basic Concepts of Fungicide Resistance", Las Brujas Research Station, National Institute for Agricultural Research, Uruguay, 20 May 2013

"Climate Change and Grain Production", West Tennessee Grain and Soybean Conference, 7 Feb 2013, Dyersburg, TN

"Foliar Fungicides on Corn: A Step Forward?" Seminar, CIMMYT (International Center for Improvement of Maize and Wheat), El Batan, Texcoco, Mexico, 28 July 2011.

*"Molecular Diagnostics: Strengths and Limitations", American Phytopathological Society Caribbean Division Meeting, Managua, Nicaragua, 24-27 Aug 2010.

"Results from University Trials, With an Emphasis on Corn", Hot-Topic Symposium on Physiological Benefits of Fungicides, American Phytopathological Society Annual Meeting, 5 Aug 2009.

"Fungicide Use on Kentucky Corn and Soybean: A New (And Questionable) Practice", Agriculture Canada Eastern Cereal and Oilseed Research Centre, Ottawa, Canada, 29 May 2009.

"Runoff of Fungicides," Atlantic Golf Course Superintendents Association Annual Meeting, Halifax, 19 Mar 2008.

SELECTED AWARDS AND HONORS

- Councilor at Large, American Phytopathological Society, 2015-2018
- Fulbright U.S. Scholar Award to Nicaragua, 2014
- Fulbright Senior Specialist in Agriculture Award to Uruguay, 2013
- M. Whiteker Award for Excellence in Extension, UK College of Agriculture, 2012
- Provost's Award for Outstanding Teaching, University of Kentucky, 2011
- Great Teacher Award, University of Kentucky Alumni Association, 2011
- Outstanding Service to Extension Award", Kentucky Assoc. of Agricultural Agents, 2010.
- Provost's Distinguished Service Professorship, 2007.
- Excellence in Teaching Award, American Phytopathological Society, 2007.
- Fulbright Scholar Award to Uruguay, 2005. The J. William Fulbright Foreign Scholarship Board.
- Master Teacher Award, Gamma Sigma Delta, Kentucky Chapter, 2004.

Appendix 16

Facilities

Appendix 16

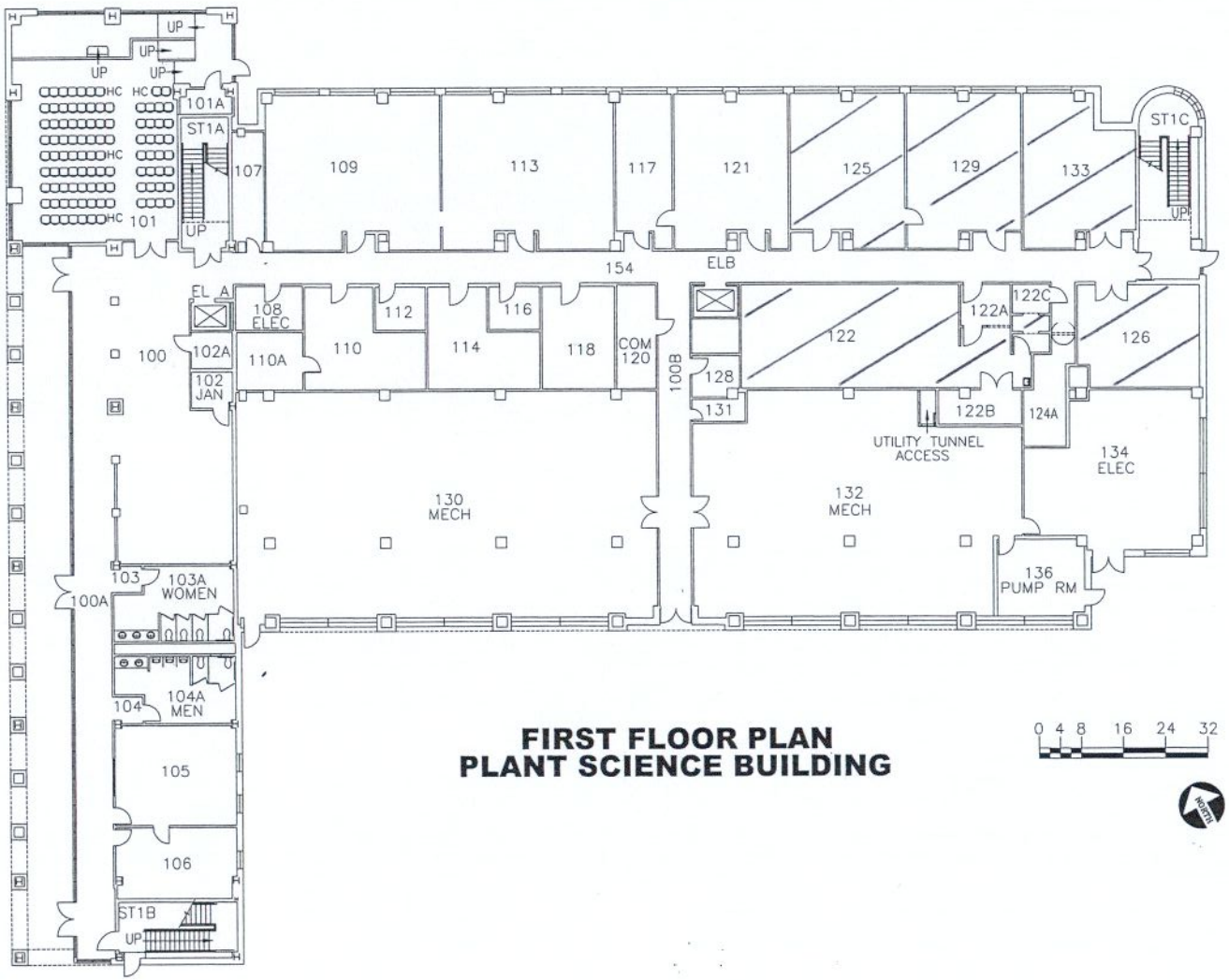
Facilities

Floor plans of the Plant Sciences Building (PSB) and greenhouses are attached. The Department of Plant Pathology utilizes the whole of the second floor of PSB, plus several rooms on the first floor (122, 125, 126, 129, 133) and one on the fourth floor (458). The main space constraint currently is in plant growth facilities, for which the current space could be rendered more functional by replacement of outdated chambers, particularly in the containment suite (room 122). Otherwise, space is adequate for the current group of faculty, students, postdocs and support staff. However, additional laboratory and possibly also office space would need to be identified if, as requested in this document, one or two new faculty lines are created in the department.

The greenhouse facilities (attached) include zones 102, 103, and 104 of Greenhouse 1, and all zones of Greenhouse 5, and total 6743 sq. ft.

The Plant Disease Diagnostic Laboratory (PDDL) on the Lexington Campus is located in rooms 115, 116, and 117A, B and C at the east end of the greenhouse complex.

In addition, a PDDL is located in the UKREC facility at Princeton, Kentucky.



FIRST FLOOR PLAN
PLANT SCIENCE BUILDING

0 4 8 16 24 32

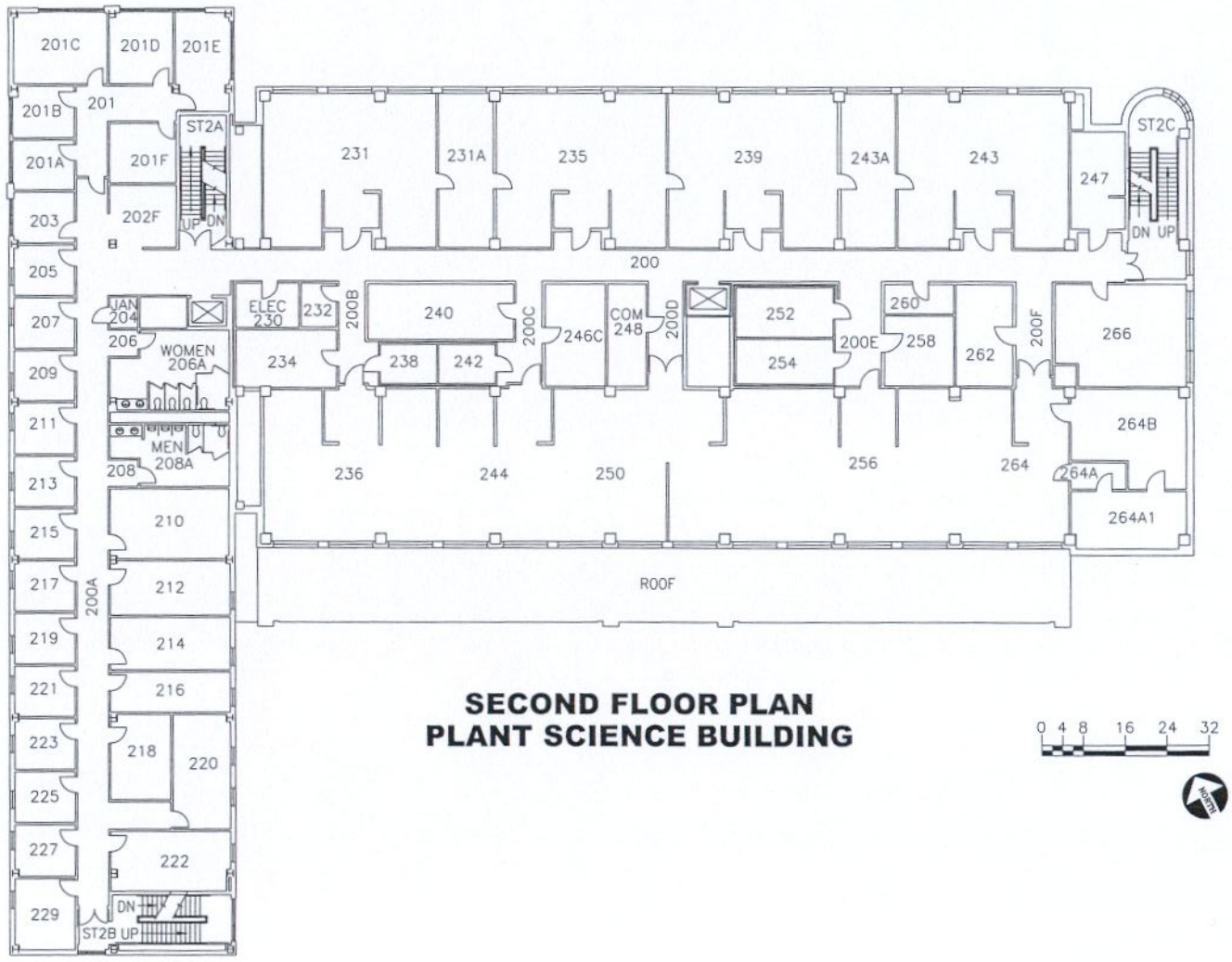
NORTH

DATE 06-20-02 REVISED BY JCM

PLANT SCIENCE BUILDING
KEY DRAWING
BLDG # 0312

PHYSICAL PLANT DIVISION

SHEET 1 - 5



SECOND FLOOR PLAN
PLANT SCIENCE BUILDING

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DATE 06-20-02 REVISED BY JCM

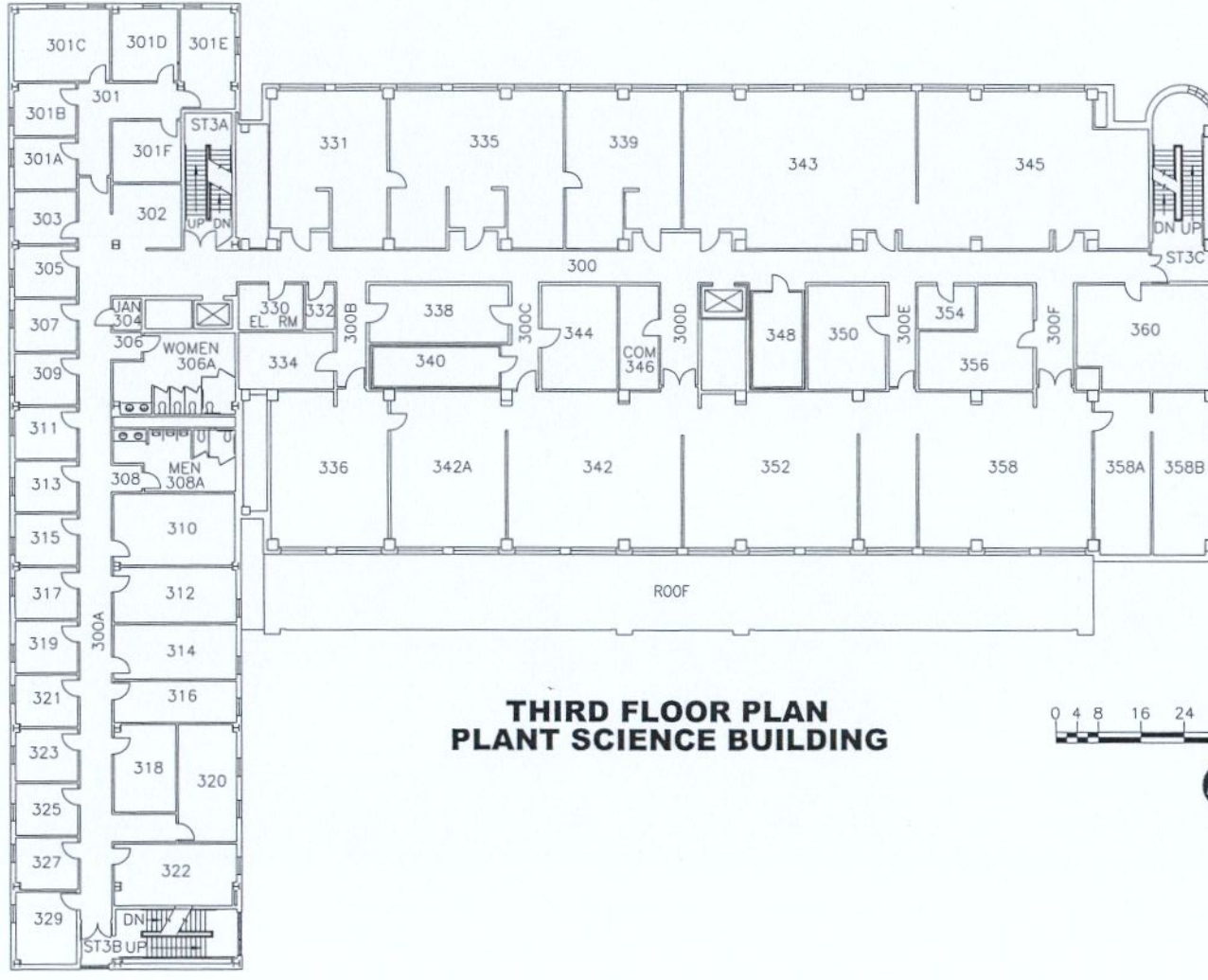
BLDG # 0312

PLANT SCIENCE BUILDING
KEY DRAWING

PHYSICAL PLANT DIVISION

UK

SHEET 2 - 5



THIRD FLOOR PLAN
PLANT SCIENCE BUILDING

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BLDG # 0312

PLANT SCIENCE BUILDING
KEY DRAWING

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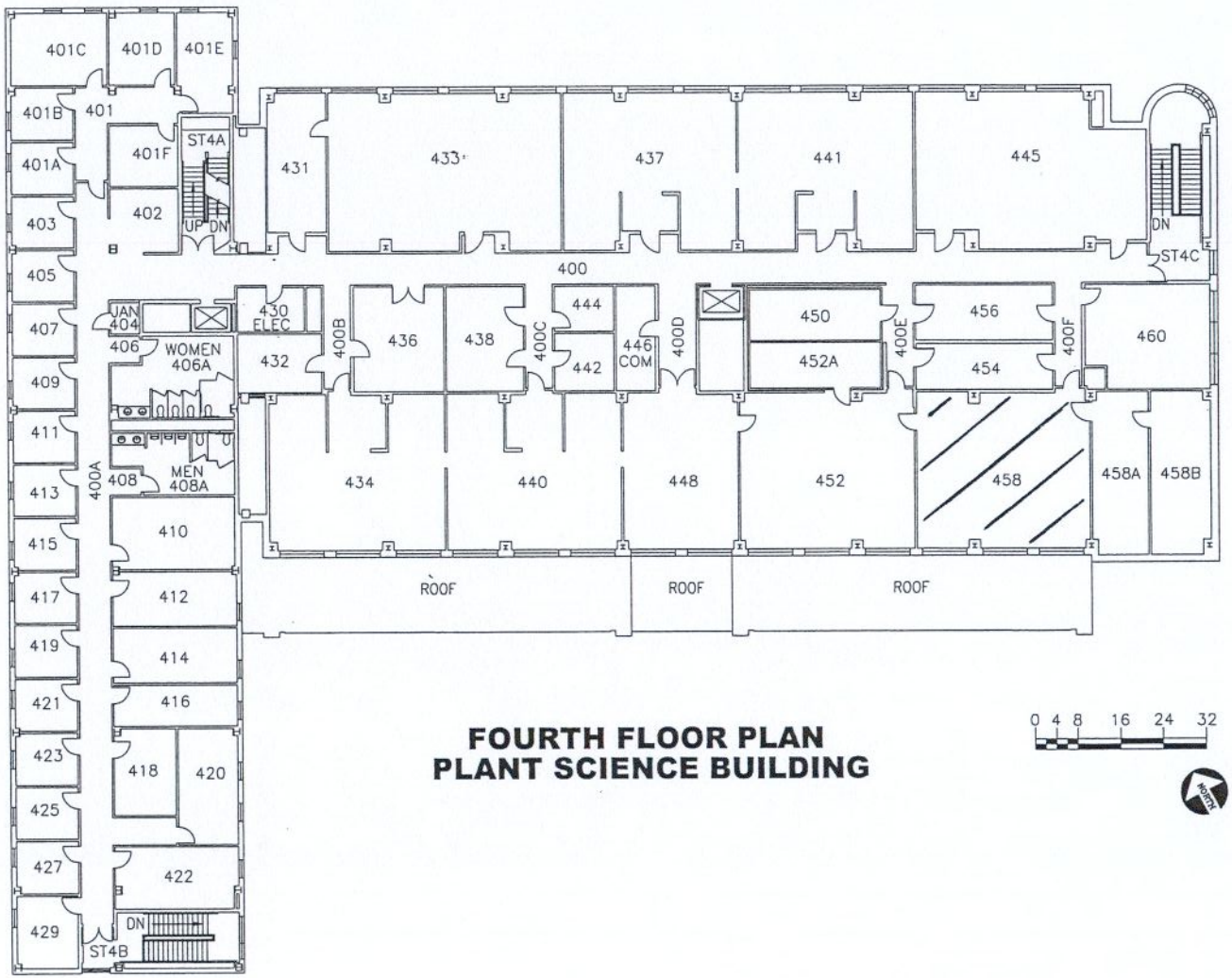
SHEET 3 - 5



FOURTH FLOOR PLAN
PLANT SCIENCE BUILDING

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NORTH

DATE 06-20-02 REVISED BY JCM

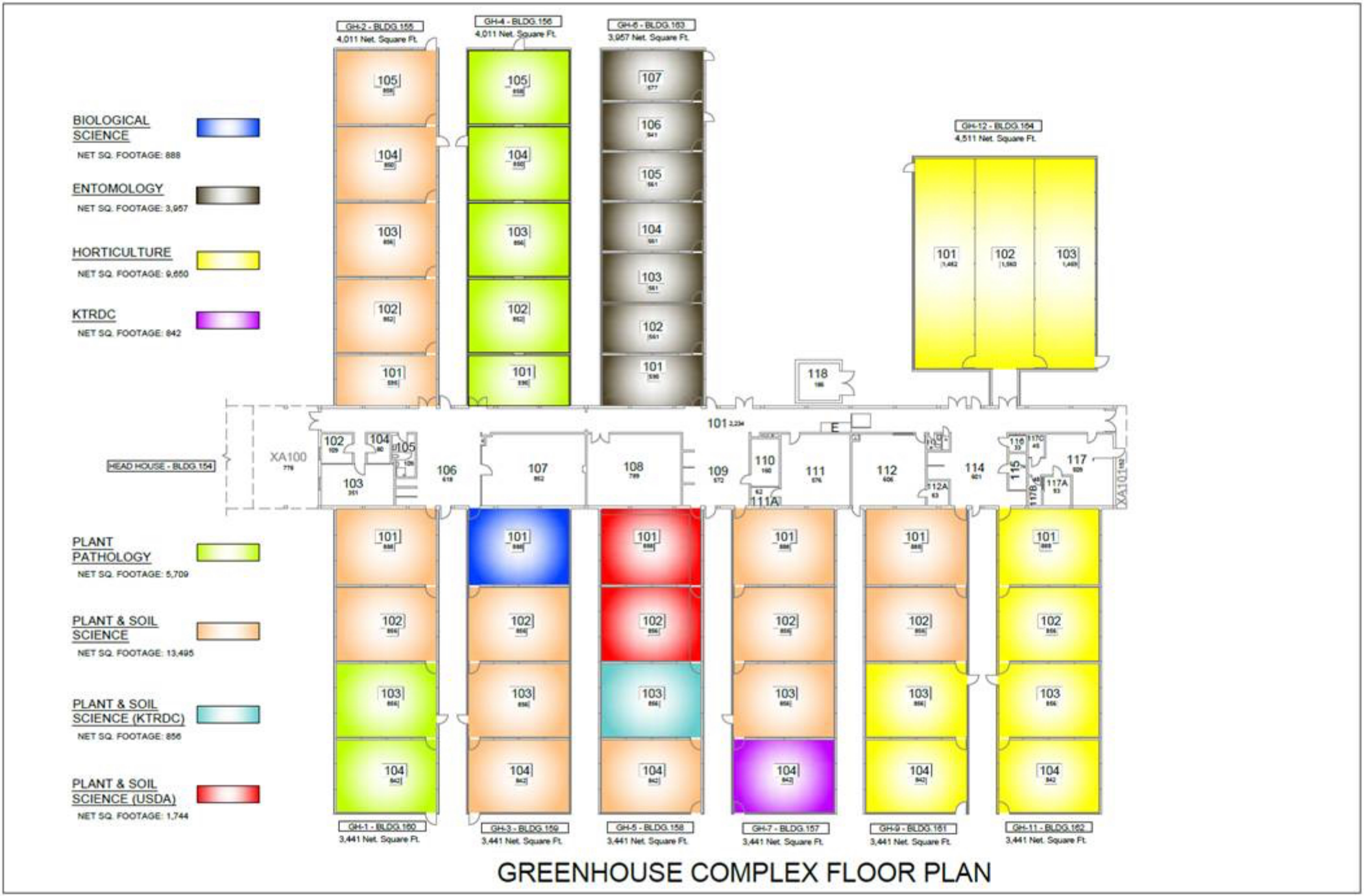
BLDG # 0312

PLANT SCIENCE BUILDING

KEY DRAWING

UK PHYSICAL PLANT DIVISION

SHEET 4 - 5



GREENHOUSE COMPLEX FLOOR PLAN

Appendix 17

Cooperative Extension Service

Agent Feedback and Comments

Appendix 17

Table 1. Agent feedback scores 2012

2012 Feedback on Extension Specialists by County Agents		Degree of Interaction	Overall Responsiveness	Value of assistance or support	Effectiveness of assistance, program or support
Department / Unit	Total Number of Responses	3=Extensive 2=Moderate 1=Minimal	3=High 2=Moderate 1=Unresponsive	3=High 2=Moderate 1=Low	3=High 2=Moderate 1=Low
4-H Youth Development	519	2.12	2.71	2.60	2.59
Ag Communications	22	1.86	2.77	2.73	2.77
Agr Economics	277	2.03	2.88	2.88	2.84
Animal and Food Sciences	616	2.06	2.84	2.86	2.85
ANR Programs	33	1.88	2.79	2.88	2.88
Biosystems and Ag Engineering	96	1.86	2.81	2.90	2.79
Community and Leadership Development	84	1.70	2.79	2.81	2.80
Dietetics and Human Nutrition	102	1.74	2.78	2.75	2.69
Entomology	222	2.21	2.97	2.98	2.96
Family and Consumer Sciences	411	2.00	2.82	2.81	2.80
Family Sciences	111	1.90	2.78	2.74	2.75
Forestry	148	1.74	2.82	2.80	2.76
Horticulture	318	2.05	2.90	2.88	2.85
Plant and Soil Sciences	359	2.24	2.88	2.87	2.82
Plant Pathology	251	2.37	2.98	2.96	2.93
Program and Staff Development	84	1.88	2.88	2.79	2.82
Regulatory Services	6	2.50	3.00	3.00	3.00
Veterinary Science	18	2.11	2.72	2.72	2.56

Table 2. Agent feedback scores 2014

2014 Feedback on Extension Specialists by County Agents		Degree of Interaction	Overall Responsiveness	Value of assistance or support	Effectiveness of assistance, program or support
Department / Unit	Total Number of Responses	3=Extensive 2=Moderate 1=Minimal	3=High 2=Moderate 1=Unresponsive	3=High 2=Moderate 1=Low	3=High 2=Moderate 1=Low
4-H Central Operations	286	2.45	2.79	2.66	2.65
Agr Economics	174	2.22	2.95	2.90	2.91
Agricultural Programs	26	1.85	2.85	3.00	3.00
Animal and Food Sciences	335	2.30	2.90	2.95	2.91
Biosystems & Agr Engineering	56	1.84	2.93	2.91	2.91
Community & Leadership Development	40	1.60	2.80	2.85	2.83
Dietetics and Human Nutrition	32	1.81	2.78	2.81	2.84
Entomology	157	2.41	2.96	2.97	2.98
Family and Consumer Sciences	154	2.27	2.88	2.86	2.85
Family Sciences	62	2.08	2.92	2.94	2.94
Forestry	97	2.02	2.93	2.86	2.85
Horticulture	229	2.25	2.85	2.84	2.81
North Central 4-H Camp	13	2.23	2.54	2.31	2.38
Plant and Soil Sciences	338	2.43	2.92	2.91	2.91
Plant Pathology	77	2.35	2.99	2.94	2.94
Program And Staff Development	53	1.98	2.94	2.92	2.91
Regulatory Services	5	3.00	3.00	3.00	2.80

Appendix 17

University of Kentucky Cooperative Extension Service

Feedback on Specialists submitted by County Agents

The comments provided below are from the survey of county extension agents from September 18 through October 12, 2014.

[Plant Pathology] - [Gauthier, Nicole] - Dr. Gauthier is a very helpful specialist who wants agents to succeed and learn how to identify diseases in the field. She held a hands on training in which she brought many samples and went over them in detail on the identifying characteristics. Great specialist!

[Plant Pathology] - [Gauthier, Nicole] - Great job with assisting agent and working with them on programing.

[Plant Pathology] - [Gauthier, Nicole] - Fantastic job - enthusiastic and helpful. Appreciate work with agents to keep up-to-speed on disease problems.

[Plant Pathology] - [Gauthier, Nicole] - Nicole is very well received by Extension Clientele. She is a very good presenter. Very knowledgeable. Seems to really want to assist agents and clientele.

[Plant Pathology] - [Gauthier, Nicole] - Unbelievably helpful, great specialist, always has a good answer

[Plant Pathology] - [Gauthier, Nicole] - I really appreciate her social media work and her willingness to come out into the state to work with agents

[Plant Pathology] - [Gauthier, Nicole] - Nicole has done a great job updating pubs and having hands on meetings around the state. I have been to several of them and have found them very useful.

[Plant Pathology] - [Gauthier, Nicole] - Nicole has been very proactive in her support for agents. This has been very helpful

[Plant Pathology] - [Gauthier, Nicole] - Nicole Gauthier has done extensive work on providing agents with new, up-to-date pathology publications and is constantly working on other materials, workshops, and trainings, all to assist agents. She is easy to work with, always accessible, and a great asset to the University and to Cooperative Extension.

[Plant Pathology] - [Gauthier, Nicole] - great information on her social media pages. always has up to date information and willing to work with county agents!

[Plant Pathology] - [Gauthier, Nicole] - Nicole has been very helpful in providing training, assistance, and resources in a very timely manner.

[Plant Pathology] - [Gauthier, Nicole] - Nicole really hasn't skipped a beat in the few years she's been here. I value her judgments and recommendations and I feel my producers value her too.

[Plant Pathology] - [Gauthier, Nicole] - Appreciate all her efforts to support agents, has made great improvements since first coming to UK, great specialist now

[Plant Pathology] - [Gauthier, Nicole] - She is absolutely great. So sad to compare her to some other recent hires in terms of usefulness.

[Plant Pathology] - [Gauthier, Nicole] - Dr. Gauthier has actively involved extension agents in revising publications, research and inservice planning. She has revised numerous publications and provided timely updates to agents and clientele via her blog and emails. She is providing excellent information on pathology.

[Plant Pathology] - [Gauthier, Nicole] - Very helpful in assisting agents and clientele. We know that this position takes much time, and is very demanding, but the response is always quick.

[Plant Pathology] - [Gauthier, Nicole] - Very helpful

[Plant Pathology] - [Gauthier, Nicole] - Innovator. She is on the cutting edge of alternative ways to reach clientele. Expert in her field.

[Plant Pathology] - [Gauthier, Nicole] - Does an excellent job

[Plant Pathology] - [Gauthier, Nicole] - I don't know how she finds time to get done all she does. She is an outstanding specialist who cares so much about helping people. We are lucky to have her. I can't say enough positive things about her. My clientele love her. She has made so much of a difference in their operations. She is a tremendous asset to the college and the university.

[Plant Pathology] - [Gauthier, Nicole] - Dr. Gauthier is very dedicated and does a tremendous job. She is a wonderful specialist.

[Plant Pathology] - [Gauthier, Nicole] - Very responsive to questions and in a timely manner. Always willing to help on the county level.

[Plant Pathology] - [Gauthier, Nicole] - very willing to help and has been a great addition to the plant pathology dept

[Plant Pathology] - [Gauthier, Nicole] - excellent great new specialist

[Plant Pathology] - [Gauthier, Nicole] - Nicole is amazing! She is the hardest worker I know! She is very efficient, and seems to do everything right! She helps us out all the time in Boone County with her plant pathology knowledge and expertise, including coming up here to visit commercial growers, speak at our commercial hort grower

workshops, provide on-line resources, get agents involved in revising publications, etc. Thanks, Nicole! You are much appreciated!

[Plant Pathology] - [Gauthier, Nicole] - great job!!!

[Plant Pathology] - [Gauthier, Nicole] - Dr Gauthier has been an excellent source of information in horticulture, in highest priority of this agent. Hands on plant pathology seminar at KACAA was a wonderful learning experience. Publications written by Dr Gauthier and others have been used many times as agent responded to homeowner's needs. Response to emails has been very helpful in answering area horticulture questions.

[Plant Pathology] - [Gauthier, Nicole] - Agent trainings conducted by Nicole have been very beneficial.

[Plant Pathology] - [Gauthier, Nicole] - Although I do not contact Nicole directly on a daily basis, I utilize the information that she has put together for us. She is excellent. We cannot do without her.

[Plant Pathology] - [Hershman, Don] - Dr. Hershman is such a great specialist. He has given me answers several times since I began my career and did a hands on training for county agents going over wheat diseases that was so helpful. Dr. Hershman will be missed when he retires.

[Plant Pathology] - [Hershman, Don] - Excellent

[Plant Pathology] - [Hershman, Don] - Dr. Hershman is a great specialist. ANR and Hort agents alike will miss him.

[Plant Pathology] - [Vincelli, Paul] - Paul is very helpful and has the ability to work with people of very different backgrounds

[Plant Pathology] - [Vincelli, Paul] - Dr. Vincelli has helped me out with some questions about GMO's. I have referenced information he's posted on LinkedIn to use with my clients. I also appreciate and use the fact sheet ID-222 that he co-wrote with Dr. Munshaw.

[Plant Pathology] - [Vincelli, Paul] - Dr. Vincelli provides excellent pathology support and publications. His work on climate change is very good considering the difficulty of discussing this issue in western Kentucky.

Appendix 18
Rules of Procedure
and
Structures of Committees

Appendix 18

Rules of Procedure
and
Structures of Committees

Department of Plant Pathology

May, 1992; Revised October, 1994 and January, 2001

These Rules of Procedure are intended to be consistent with the Governing Regulations and the Administrative Regulations of the University of Kentucky and the laws of the Commonwealth of Kentucky and of the United States of America. In the event that these Rules of Procedure are inconsistent or contrary to the above-mentioned regulations and laws, then those regulations and laws control.

I. Organizational Structure.

The Governing Body. The governing body of the department comprises the tenure-track faculty and chair. The governing body will accept input from any and all members of the department, whether transmitted through committees or by individuals.

The Faculty. The faculty of the department consists of the chair and those members of the department who hold tenure-track positions having the rank of assistant professor, associate professor or professor in the regular, extension or special title series in the College of Agriculture. In addition, membership may be extended to any other member of the department who performs research, teaching, extension and/or administrative duties. Any tenure-track faculty member may nominate such individuals for inclusion and membership shall be extended by majority vote of the tenure-track faculty members.

The Chair. The chair provides leadership to the faculty in the development by the department of policies on such matters as instructional and research programs, service functions, and further duties and responsibilities specified in the Governing and Administrative Regulations. The chair presides over all departmental meetings, except as he/she may delegate this function, and is an ex officio member of all departmental committees. The chair has administrative responsibility for implementing the department's program within the limits established by the Governing and Administrative Regulations of the University, the Rules of the University Senate and the directives of the College of Agriculture. The chair manages the day-to-day operations of the department in all matters which do not require joint deliberation. The chair is responsible for recommendations to the Dean of the College of Agriculture on the appointment of new members of the department, promotions, reappointments, terminal appointments, decisions not to reappoint, post-retirement appointments and

granting of tenure. The chair is responsible for administering the periodic evaluation of departmental members by procedures and criteria established by the university, the College of Agriculture and the tenure-track faculty. The chair shall submit a budget proposal for approval of the faculty.

The Director of Graduate Studies. Under the administrative oversight of the chair, one tenure-track faculty member (who may be the departmental chair) and who is a full member of the Graduate Faculty, will serve as director of graduate studies (D.G.S.) and will have responsibility for matters pertaining to the graduate program. The D.G.S. is appointed by the Dean of the Graduate School upon recommendation of the chair. The D.G.S. nominee shall be selected for a three-year term by a majority vote of the Graduate Faculty. Responsibilities of the D.G.S. will include corresponding with individuals enquiring about the graduate program, chairing the Academic Program Committee and performing all normal activities of a D.G.S. as expected by the Graduate School.

The Recording Secretary. One member of the faculty will act as recording secretary, preparing the minutes of faculty meetings and providing copies of the minutes to the faculty within one week after each faculty meeting.

The Parliamentarian. One member of the faculty will act as parliamentarian for faculty meetings. The parliamentarian will assure that faculty meetings are conducted according to Robert's Rules of Order.

II. Conduct of Meetings.

Notice of date, time, place, and agenda of departmental faculty and committee meetings will be prominently posted just outside the departmental office at least one working day before meetings. All meetings will be open except where closed sessions are permitted and conducted in accordance with current laws and regulations. The chair of the department or committee shall ensure that minutes of meetings are taken and provided to the office of the chair of the department. Minutes of all departmental and committee meetings shall be maintained in the office of the chair of the department and copies shall be available to anyone upon request.

III. Faculty Meetings.

Faculty meetings will be held on the first working Monday of every other month (Jan., Mar., May, Jul., Sep., Nov.) and at other times as deemed appropriate by the chair or a majority of the tenure-track faculty. Individuals encouraged to attend the meetings will include all faculty and a representative from each of the following departmental personnel categories; graduate students, clerical staff,

postdoctoral staff and technical staff. These four representatives will be selected by their respective peer groups. Items for the agenda at faculty meetings should be submitted to the chair in advance of the meetings but items may be added to the agenda during the course of each meeting. Voting rights will only extend to faculty members. Absentee voting by faculty will be allowed on agenda items about which previous notice has been given and provided the vote is submitted in writing to the chair. A quorum will require attendance by at least 50% of the faculty.

IV. Departmental Town Meetings.

Two departmental town meetings will be held each year. These will be open to all members of the department. The primary purpose of these meetings will be to allow a free and open exchange of information and ideas concerning any matters affecting the department.

V. Committee Structure.

Academic Program Committee. This committee shall submit recommendations on educational policy to the faculty for approval. The primary responsibility of this committee will be to provide continuing oversight of the academic activities of the department, particularly those concerning the graduate program. Duties will include reviewing applications to the graduate program, determining admission of and/or assistantship support for applicants, providing initial counsel to newly admitted graduate students, orchestrating graduate student recruitment efforts, curriculum planning, course scheduling, screening of syllabi and peer evaluation of teaching. This committee will maintain and distribute to faculty and students a current handbook of degree requirements. This committee will be comprised of the D.G.S., who will serve as committee chair, the department chair, two other faculty members and one graduate student.

Faculty Merit Evaluation Committee. The primary responsibility of this committee will be to provide counsel to the chair on faculty merit evaluations. This committee will be comprised of the department chair, as committee chair, and three other faculty members (one from extension, one from research, and one from either speciality). The three faculty counselors will serve for one biennial evaluation period, and may not succeed themselves. Only tenure-track faculty may vote for the members of, and serve on, the Faculty Merit Evaluation Committee.

Resource Committee. The primary responsibility of this committee will be to provide counsel to the chair concerning the human, fiscal and physical resources of the department with the intent that these be utilized in optimal fashion. Matters

for consideration will include staff evaluation protocols, staff recruitment, budget items and the allocation of space and physical facilities (particularly as program priorities and activities change over time). This committee will be comprised of the department chair, as chair of the committee, three other members of the faculty and one non-faculty departmental member.

Safety Committee. The primary responsibility of this committee will be to ensure continual review of safety matters in the department. This committee will be comprised of the departmental chair, two other faculty members and two non-faculty departmental members. A chair will be selected by the committee members.

Committee members will be nominated at faculty meetings and, if willing to serve, elected by majority vote of the faculty. Appointments to committees will normally be for two-year terms, except for student members who will serve for one year. Committee members may be reappointed to the same committees in succession, with the exception of the Faculty Merit Evaluation Committee, following the nomination and voting protocols.

In addition to the four standing committees listed above, the department chair may appoint such additional ad hoc committees as are necessary. Regular and ad hoc (if any are organized) committees will make reports to faculty meetings at least once a year. Recommendations from committees are not binding and must receive a majority vote at faculty meetings for any action to be taken. Exceptional to this requirement will be decisions made by the Academic Program Committee as regards the admission of, and support for, new graduate students. Matters for deliberation outside the purview of standing or ad hoc committees will, if appropriate, be voted upon at faculty meetings with those members attending representing a Committee of the Whole.

VI. Criteria for Appointment, Promotion and Granting of Tenure.

Recommendations regarding appointments, reappointments, terminal reappointments, decisions not to reappoint, post-retirement appointments, promotion, tenure, and tenure progress review are handled in accordance with the procedures and criteria established by the University, the College, and the department faculty. Unit expectations are initially stated in each faculty position announcement. Any subsequent modifications of these expectations (e.g. a new teaching assignment) are addressed through the Distribution of Effort and faculty performance evaluation and review processes. Professional judgment by faculty of the quality and quantity of an individual's accomplishments ultimately drive decisions regarding appointment, as well as recommendations with respect to promotion and tenure.

Appendix 18

VII. Merit Evaluation of Faculty.

Following protocols and criteria provided by the College of Agriculture, the department chair will provide a rating of each faculty member to the college administration. In arriving at this departmental rating, the chair will take verbal counsel from the three other members of the Faculty Merit Evaluation Committee, who will review the documentation concerning evaluation prepared in accordance with college directions by each faculty member to be reviewed. Each committee member will also submit a written evaluation to the chair. Upon request, a faculty member may receive written reasons from the chair for his/her departmental evaluation, following the college's and department's current evaluation criteria. Once the faculty ratings leave the department, the merit evaluation process will follow College of Agriculture and university protocols.

VIII. Guidelines for Assistant Research Professorship Appointments.

(Prepared by Ad Hoc Committee on Assistant Research Professorships and Amended following Faculty Meeting of 11/1/99)

Eligibility. Each applicant for appointment to the Research Title Series must be a post-doctoral fellow/scientist in the Department of Plant Pathology and have been awarded a research grant for which he or she is the Principal Investigator named on the research proposal. The research grant must contain sufficient funds to pay the full salary and fringe benefits of the applicant and to cover the costs of the applicant's research project that cannot be met by the sponsoring faculty member. The sponsoring faculty member may or may not be a co-Principal Investigator on the grant proposal.

Required Documents. Each person who wishes to be considered for appointment to the Research Title Series must submit the documents that are required for applications for regular research faculty positions. The following documents are to be submitted:

- a letter of application
- a comprehensive curriculum vitae
- a statement of purpose and plan of the research to be undertaken
- proof of receipt of a research grant that meets the requirements noted above
- a letter of recommendation from the sponsoring faculty member

The applicant may also submit other materials (including additional letters of reference) in support of his or her qualifications for the position. The application documents should be submitted to the department chair who will have copies distributed to each member of the departmental faculty (tenure-track faculty only). The applicant is encouraged to post the non-confidential parts of these documents on a web server and to publish the address to the departmental

faculty.

Seminar. As part of the application process, the candidate must present a departmental seminar in which the current research project and the research to be undertaken (including relevant background information) are described. The seminar presentation must take place prior to the faculty meeting at which the candidate's application will be formally evaluated.

Evaluation. A meeting of the faculty (tenure-track faculty only) of the department will be convened for the purpose of reviewing and evaluating the applications. No non-faculty persons will be present at the meeting. A positive vote by a majority of the faculty (tenure-track faculty only) of the department will be required for approval of the application.

Duration. In keeping with the university administrative regulations, appointments to Assistant Research Professor will be for a specific term not to exceed three years. Expiration of grant support will result in termination of the Assistant Research Professor designation. Reappointment of an Assistant Research Professor in the Research Title Series for one or more additional terms is permissible but will require successful completion of all the application conditions to be met by initial appointees to the Assistant Research Professor rank.

Conditions of Appointment. Conditions of appointment must be agreed upon by the department chair, sponsoring faculty, and the candidate.

IX. Revision of the Rules of Procedure

These Rules of Procedure, with a majority vote of the faculty, may be modified at any faculty meeting.

These Rules of Procedure have been created and approved by the faculty of this department pursuant to the authority granted by the Administrative and Governing Regulations of the University of Kentucky. These rules do not become effective until and unless approved by the dean and chancellor as indicated by their signatures below. Any modifications to these rules must also be approved by the dean and chancellor before the modifications take effect. These rules contain a total of six pages, each of which are initialed and dated by the undersigned persons. Current copies of the approved rules for this department are available in the offices of the chair, dean, and chancellor.

_____	_____
Chair (indicating approval by the faculty)	Date
_____	_____
Dean, College of Agriculture	Date
_____	_____
Chancellor, University of Kentucky, Lexington Campus	Date

Site Visit Agenda

Department of Plant Pathology
Program Review Site Visit Agenda
October 18-20, 2015

Sunday, October 18

Arrivals:	Dr. Rupe arrives at Bluegrass Airport at 4:18 p.m. via Delta flight # 5228. Designated local committee member transports Dr. Rupe to Holiday Inn Express & Suites, 1000 Export St., 859-389-6800. Ms. Ellis and Dr. Panaccione arrive via personal vehicles.
6:15 pm	Designated local committee member transports Ms. Ellis, Dr. Panaccione and Dr. Rupe from Holiday Inn Express & Suites to Bella Notte Restaurant, 3715 Nicholasville Rd, Lexington, 859-245-1789
6:30 pm-8 pm	External Committee has dinner and working session. Group is joined by department chair Chris Schardl. Local committee member returns Ms. Ellis, Dr. Panaccione and Dr. Rupe to Holiday Inn Express & Suites

Monday, October 19

8:00-8:30	Breakfast on own at Holiday Inn Express & Suites
8:30-8:45	Designated local committee member transports external guests to Plant Science Building
8:45-10:00	Meet department chair Dr. Chris Schardl, for departmental facility tour and discussion: 266 Plant Science Building, Greenhouse Complex, Plant Disease Diagnostic Laboratory (PDDL)
10:00-10:15	Break and go to S125B Agricultural Science Building North
10:15-11:00	Meet with College of Agriculture, Food and Environment Dean Cox and Assistant Dean for Academic Administration Lisa Collins, S125B Ag N.
11:00-12:00	Meet with Associate Deans, S125B Ag N Dr. Rick Bennett, Research Dr. Larry Grabau, Instruction Dr. Jimmy Henning, Extension Dr. Steve Workman, Administration
12:00-12:15	Break and go to Plant Science Building
12:15-1:15	Working lunch with graduate students, 266 Plant Science Building
1:15-2:00	Meet with research faculty, 266 Plant Science Building

2:00-2:45	Meet with Extension faculty, 266 Plant Science Building
2:45-3:30	Meet with post docs and visiting scientists, 266 Plant Science Building
3:30-4:30	Work session, 266 Plant Science Building
4:30-4:45	Designated local committee member transports external guests to Holiday Inn Express & Suites
5:45	Designated local committee member transports external guests to Dudley's Restaurant, 259 W. Short St., 859-252-1010
6:00-7:30	Working dinner at Dudley's Restaurant for all committee members
7:30	Designated local committee member returns Ms. Ellis, Dr. Panaccione and Dr. Rupe to Holiday Inn Express & Suites

Tuesday, October 20

7:15-7:30	Designated local committee member transports external guests to First Watch, 1080 S. Broadway, 859-252-2226
7:30-8:30	Working breakfast with review committee at First Watch
8:30-8:45	Designated local committee member transports external guests to 266 Plant Science Building
8:45-9:30	Meet with support staff, 266 Plant Science Building
9:30-10:15	Meet with Extension agents, 266 Plant Science Building
10:15-11:00	Meet with technical staff scientists, 266 Plant Science Building
11:00-11:15	Break, 266 Plant Science Building
11:15-12:00	Meet with Plant Disease Diagnostic Laboratory staff, 266 Plant Science Building
12:00-2:00	Working lunch, 266 Plant Science Building
2:00-2:15	Break, go to S-125B Ag N
2:15-3:15	Meet with the Dean Nancy Cox, S-125B Ag N to present preliminary findings
3:15	Designated local committee member transports external guests to Holiday Inn Express & Suites.
Departures:	Dr. Rupe is transported to Bluegrass Airport at 5:15 p.m. for Delta Flight # 4991 departing at 6:32 p.m. Ms. Ellis and Dr. Panaccione depart via personal vehicles.

External Review

Departmental Program Review External Review Report
Department of Plant Pathology, University of Kentucky
November 19, 2015

Table of Contents **Page**

1. Description of Review Team and Process

A. Committee Membership

John Obrycki, Chair, Department of Entomology, UK

Bruce Downie, Associate Professor, Department of Horticulture, UK

Debbie Ellis, Executive Director of the KY Soybean Board

Jay Hettmansperger, UK County Extension Agent for Agriculture & Natural Resources, Garrard County, Kentucky

Peter Nagy, ex officio, Professor, Department of Plant Pathology, UK

Dan Panaccione, Professor, Division of Plant and Soil Sciences, West Virginia University

John Rupe, Professor, Department of Plant Pathology, University of Arkansas

Rebekah Whitley, PhD Student, Department of Plant Pathology, UK

B. Review Process

The members of the review team were provided with the Department of Plant Pathology self study document http://administration.ca.uky.edu/files/ppa_self_study.pdf.
The agenda for the review team site visit is attached.

The review team met with Chris Schardl, Chair of the Department of Plant Pathology for dinner on October 18, 2015. On October 19 and 20, 2015, the team toured the Plant Pathology facilities, met with college administrators, and members of the Department of Plant Pathology.

2. Areas of Strength and Key Points from the Department of Plant Pathology Self Study Document

Areas of Strength

- The department has an outstanding record of research productivity. The faculty are recognized as leaders in their fields of expertise.

- The Department is nationally recognized as one of the top departments of plant pathology in the United States.

- The extension faculty have developed excellent, well-recognized and important programs for the citizens of Kentucky. The Plant Disease

Diagnostic Lab provides timely, accurate, and vital diagnostic services for Kentucky.

- Outstanding research and extension faculty, who have developed internationally recognized programs that attract exceptional graduate students and post-docs.

- Significant contributions to college interdisciplinary undergraduate program in Agricultural Biotechnology.

- Outstanding technical and office staff. Highly dedicated employees who really care about the success of the department.

- Outstanding extension staff and diagnostic lab staff, highly dedicated to assisting the citizens of Kentucky.

- The department provides excellent training for graduate students and post-doctoral fellows and has excellent mechanisms in place to assess learning outcomes of their graduate program.

Key Points

- The department has lost several faculty positions due to budget cuts and retirements and is now in jeopardy of dipping below a critical mass of faculty.

- Research equipment required to remain a top research program in plant pathology is aging and needs to be updated.

- Additional space needs to be identified by the college administration when the Department of Plant Pathology adds new research faculty.

3. Evaluation of Quality and Productivity

The review team did not focus on the department's adherence to university and academic policies, however the team did not learn of anything to indicate that the department was not following these policies. The office staff indicated that it is following University of Kentucky business procedures.

A. Quality of the collegial environment

Based on our discussions with members of the Department of Plant Pathology, the review team felt that the environment in the department was generally very positive. There will always exist some pressure to acquire the next set of data for the next grant proposal, but overall the review team concluded that the quality of the collegial environment in the Department of Plant Pathology was very good.

B. Quality and productivity in instruction, research, extension and operations

The following sections summarize the review team's meetings with groups of individuals from the Department of Plant Pathology (agenda attached). These discussions provided the review team with various viewpoints about the quality and atmosphere within the department. Collectively, they support the team's conclusions that the Department of Plant Pathology is an outstanding department, whose mission is supported by groups of dedicated staff, students, post-docs, and faculty.

i. Research Faculty

The plant pathology faculty expressed their fondness of the supportive and colleagual environment in the department, the effective sharing of multiuser instruments housed in common use labs or individual faculty labs, and the positive interactions among faculty, postdocs, students, and technical staff. They also appreciate the modern facility in the Plant Science Building. However, they expressed concerns over their relatively lower salaries when compared to faculty at peer universities, and the relatively high load of duties outside of research, such as graduate and undergraduate teaching and committee assignments, which take away from the considerable grant writing efforts required to secure federal and state funding. The faculty is very concerned about space limitations that do not allow hiring of new faculty without additional new labspace, the aging instrumentation in most labs, and the high cost of maintaining service contracts, which require most of the indirect costs coming back to the department. The faculty expressed their need for a new confocal microscope and plant growth chamber(s) to keep their programs successful. They also expressed concerns about the limited number of fellowships for graduate students that puts pressure on the faculty to use grants for graduate stipends and train inexperienced graduate students while pressured by deadlines for progress reports for those grants. The scarce student fellowship availability also limits the ability of faculty to open up new areas of research that would make them far more successful in securing additional grants.

i. Extension Faculty

The department has top-notch extension faculty who are well respected and appreciated throughout the state. Although they have recently lost two senior faculty members, the newly hired extension faculty have already made an impact and are highly thought of by county extension agents and growers. The committee heard from a number of stakeholders about the excellence of the current group of extension faculty. It was emphasized several times during this review that the department faces a difficult task retaining such outstanding extension faculty in the face of industry enticements.

Several of the extension faculty have served as major advisors or co-major advisors of graduate students. This involvement with graduate students has been a very positive experience for the extension faculty. The review team suggests that an excellent step to retain and ensure the success of new

extension faculty would be the opportunity to co-advise a graduate student with a member of the research faculty. This opportunity could be supported by a departmental assistantship.

Although faced with important challenges, the extension faculty were positive about their positions and worked together to find ways to accomplish their mission. The review team was informed of three major challenges faced by the extension faculty.

Funding for in-state travel and other activities is limited. Extension faculty have supplemented their budget with industry gifts to some extent, but those funds may be more limited now than in the past. More funds for in-state travel are needed and it would help if there was funding for work on crops without commodity support. Options to augment their budget were discussed and include: a fee for diagnosis to support the program, a flat-fee from each of the counties, and/or, seek additional support from state government in Frankfort. None of these options appear viable to the extension faculty. The extension faculty may consider approaching commodity groups for support for in-state travel.

Laboratory space is extremely limited in Lexington. The three Lexington-based extension faculty share one small laboratory which must accommodate processing soil and plant samples, as well as isolating and maintaining pure cultures of pathogens and running molecular tests for detection and identification of pathogens. This not only limits the type and extent of research they can conduct, but also discourages them from taking on graduate students. Assigning additional laboratory space that they could use as a clean lab is desperately needed. Although we did not see the facilities at the Princeton Station, we understand that, except for an inadequate autoclave, space is not limiting for extension and research activities.

There appears to be a lack of support from Ag. Communications for the extension mission within the Department of Plant Pathology. This is an area that needs to be examined at the college level.

Both extension and research faculty commented on the positive aspects of being housed together. This synergy should be remembered when space allocation changes are considered by the college.

ii. Technical Staff

The department has a well-trained, dedicated, and experienced technical staff serving the research faculty. They appreciate the flexibility the department gives them in dealing with health and family issues. The staff expressed frustration with broken and unreliable equipment, particularly the growth chambers. They either have to fix the equipment or find alternative ways to complete an

experiment, which makes it difficult to produce the needed results in a timely manner.

Communication between the staff and the other members of the department needs to be improved. (Suggestion from the Review Team) Staff are not introduced to new post docs or students, which poses a safety issue with open labs. The staff may not know if the new person in the lab belongs there or not. The staff feel increasingly isolated within their own research group and are concerned about departmental cohesion. They feel left out of decisions that directly affect them. They felt that communication was better when departmental seminars were required giving the members of the department a time when everyone could meet and new people were introduced.

Professional development opportunities are limited. Taking classes is either not encouraged or is discouraged by their PI's because of the time commitment.

It is commendable that there are both staff and student representatives at faculty meetings, but each staff member only attends one meeting every two years. **Electing a staff member to serve as the staff representative at faculty meetings for a year term would give the staff a more effective voice in faculty meetings.** (Suggestion from the Review Team)

ii. Office staff

The Department of Plant Pathology has an exceptional office staff. Every effort should be made to retain these individuals and support them in their assignments. The number of support staff is sufficient, but not excessive, in relation to the size of the department. The four members of the office staff have well-defined and complementary duties, but also have enough overlap in skill sets that they can help each other when changes in schedules or workload increase demand in one area. The staff are aware of professional development opportunities and feel supported when they choose to take advantage of those opportunities. Each staff member is highly dedicated to their responsibilities and to the well-being of the department as a whole. They have good relationships with the department chair, faculty, technical staff, postdocs, and students. They clearly respect the personnel in each of these groups and in return feel appreciated. These sentiments were echoed in meetings with the department chair, faculty, technical staff, students, and postdocs. This well-functioning unit should be commended for their professionalism, their efforts to keep the department running efficiently, and their part in creating a positive work environment.

iii. Quality of orientation and advising programs for students

Programs for undergraduate students
The Department of Plant Pathology does not directly administer an undergraduate program; however, several faculty participate significantly in the

interdisciplinary undergraduate Agricultural Biotechnology (ABT) major, including service as the co-director of the program. The Agricultural Biotechnology major requires a semester of research experience in a principal investigator's laboratory for each of the approximately 120 students in the program. Several Plant Pathology faculty mentor students in this program. Faculty participate in this program because they are dedicated to advancing the program and contributing to the development of the students. They must use their own resources when mentoring students in the program. The review committee commends the faculty for their commitment to undergraduate mentoring, but also recognizes the potential drain on faculty time and resources. The administration may wish to consider providing some support for undergraduate (ABT) research projects, as an incentive for faculty mentoring of students in this program.

Programs for graduate students

The department has very bright and capable graduate students who are very dedicated to their research projects. Because of the high level of collegiality in the department, graduate research is very well supported with shared equipment, ready advice on research problems from both staff and faculty, and close working relationships between students and their advisors. Funding of assistantships is primarily through grants with three state-funded assistantships in the department. While this is common in most, if not all, departments nationally, demands of the granting agencies (USDA, NSF, NIH) may be compromising graduate education in the department. Students are discouraged from taking classes outside of those required by the department, because class time takes away from their research. While the department's courses appear to do a very good job of covering plant pathology, especially from a fundamental point of view, they may not address all of the student's needs and few of the classes have labs that give the students hands on experiences. Professional development is mainly through work on their research project. Students perceive that opportunities to travel to meetings are limited, they do not have a journal club, and there are few non-work social events organized either by the students themselves or with the department as a whole. These functions are important in building department cohesion. Many students, apparently, don't play a primary role in writing their own papers, but only edit drafts of papers. This all appears to be due to the high research demands of grants to their mentors. **Considering the demands of the department's research program, the review team suggests that the department discuss if it might be advisable to only accept students who already have an MS rather than begin a Ph.D. program with only a bachelor's degree. The department needs to consider if it is adequately training students to be successful as scientists who can develop and run their own research programs**.

iv. Quality of Facilities

A red thread throughout the discussions with the Department of Plant Pathology Faculty and leadership has been the replacement of critical, shared equipment that is now failing on a frequent basis to the point of being useless, despite taking up valuable space allocated to the department. In particular, the plant growth

chambers on the first floor must be replaced with functional chambers that are dependable. A second issue is the obsolete Confocal microscope housed in the Plant Pathology Department. This machine was purchased 13 years ago and has been surpassed by better technologies in the subsequent years. If the department is to increase in Research Faculty, then wet bench space, preferably in the Plant Science Building, must be identified for these faculty. Furthermore, the extension core of the department is disheartened by the small space allocated to the group. Their wish would be for a "dirty room" and a molecular biology room in the Plant Science Building, preferably on the first floor, to allow them to better serve their clientele and to improve their capacity for research, which is a component of all of their programs, despite not being reflected in their FTE's. **The review team strongly suggests that the department examine the need for additional space for the extension faculty**. Finally, maintenance contracts for major equipment within the department are completely dependent on the department. The university, with an emphasis on research and the overhead charged to grants, must be approached to ascertain their commitment to supporting basic infrastructure. **A suggestion from the review team is to consider charging a nominal fee for growth chamber use to be put toward maintenance contracts.** User's fees can be included as direct costs in proposal budgets, whereas service contrasts typically cannot be included as direct costs and presently exhaust most of the indirect funds returned to the department.

C. Quality of stakeholder/client satisfaction

i. Student satisfaction

The graduate students of the Department of Plant Pathology feel that there is exceptional communication amongst graduate students, post doctorates, and technical staff, as well as good communication with Principal Investigators. The ability for the members of the department to work together, trouble-shoot, and share equipment and supplies, as needed, has greatly benefited the graduate students and increased their ability to be productive in their research. While research is an instrumental and critical aspect of graduate education, the students felt the need for more emphasis on education, i.e. classes in the first 1-2 years of graduate school. Allowing for a transitional period in the first 1-2 years would give students the ability to concentrate more on classes and have less pressure to produce data, hopefully increasing success and retention of graduate students. One change that the graduate students would like to have implemented is the increase in opportunities for professional development. Professional development may include the following: increased opportunities and support to attend professional meetings, education on grant writing and manuscript writing, as well as increased involvement in writing manuscripts. A bigger emphasis on education and professional development will increase the success of students both in graduate school and in their future careers.

ii. Post-doctoral Fellows and Visiting Scholars satisfaction

Both post-doctorates and visiting scholars feel that there is an exceptional degree of comradery in the department that provides them with a wonderful

environment to work and interact with other department members. They are supported and encouraged to present their research at professional meetings. Along with the graduate students, the post-doctoral scholars desire the opportunity for professional development but mainly the opportunities to have a part in grant writing and more involvement in writing the first drafts of manuscripts. While the post-doctorates and visiting scholars have the opportunity to be productive in their research, they would like to increase their writing skills which ultimately will make them more successful in their careers both in and outside the department.

iii. Extension agent satisfaction

The county extension agents are highly satisfied with the Plant Pathology Department and the diagnostic lab. The expertise of the Plant Pathology extension specialists and diagnostic lab staff are invaluable tools in the daily routine of an agent's work. The agents interviewed were very complimentary of the specialist and lab personnel. There is a high level of personal communication between agents and Plant Pathology extension specialists. Agents have rated very highly the value and assistance they receive from the department. There is a sense of comradery among specialists and agents. The agents ask that the department maintain the high standard of excellence of specialists who are currently employed by the Department of Plant Pathology.

iv. Commodity organizations

The Department of Plant Pathology is well known for outstanding work in research and extension throughout the soybean industry. The Kentucky Soybean Promotion Board has worked with members of this department for many years and funded several long-term projects. Their work has been critical to help producer's better control the impact of yield loss from devastating diseases. The Board has also worked closely with extension specialists to prepare for Soybean Rust that appeared in southern states and was expected to infest northern areas of soybean production. The Plant Diagnostic Lab at the UK Research and Education Center in Princeton is important to soybean producers in detecting Soybean Cyst Nematode and other diseases, and the board expects to continue the relationship and the program with the newly hired extension specialist at Princeton.

D. Quality of Extension program

The Plant Pathology Extension team has done an excellent job maintaining high quality programs to meet the needs of county extension agents, farmers, and homeowners. Feedback by agents in Appendix 17 of the program review self-study report shows a high level of approval of the Plant Pathology Department by county extension agents. The Plant Pathology Department received some of the highest marks, compared to other departments within the college. The team works very hard to keep their programs current and timely. The team has been open to new means of disseminating information to the counties and clientele by using social media and video conferencing. The extension agents were very complimentary of the entire team of extension specialists and diagnostic lab

personnel. The diagnostic lab is an invaluable asset to the daily success of an extension agent's work. The excellent specialist and county agent interaction keep the programming needs current and useful. This also goes for the good communication between the lab personnel and specialists.

4. Recommendations for Quality Enhancement

The review team sees a real need for new faculty members in the department to restore a critical mass of colleagues. The department should develop a comprehensive multi-year plan for new faculty members. This plan should include the rationale and justification for new positions and their start-up and space requirements.

The department should also develop a priority list of equipment needs that includes the rationale and justification for replacement of older equipment. This document should include plans for identifying multiple potential funding sources, including consideration of the college's recent support to purchase three new plant growth chambers for the department.

The impression of the review team members is that there is uneven emphasis on the professional development of graduate students, post-docs, and visiting scientists within the department. The team recommends that the faculty, with input from graduate students, post-docs, and visiting scientists, develop comprehensive plans for the professional development of all members of the department.

The impression of the review team is that most programs within the department are facing financial difficulties. The team recommends that the department develop plans, in conjunction with the college Office of Advancement, to identify new sources of funding to support the department.

Recommendations from the Review Team

The review team recommends/suggests that the department:

- Develop a comprehensive graduate student orientation program for both domestic and international students.

- Promote an active social committee to foster interactions among all members of the department

- Develop plans to promote travel to professional meetings by all graduate students in the department.

- Examine new sources of funding to support in-state travel for extension faculty and develop plans with the Associate Dean for Extension to adequately fund the extension programs within the department.

- The Plant Pathology faculty should discuss a proposal to provide some financial support for undergraduate (ABT) research projects with the college administration. This could serve as a positive incentive for faculty mentoring of students in the ABT program.

- Due to the recent relocation of the Advanced Genetic Technologies Center (AGTC) facility to the Medical Center, the Plant Pathology faculty may consider developing graduate student workshops to address the loss of the hands-on experiences that were provided by AGTC staff.

- Encourage faculty to take sabbatical leaves to improve their skill sets and refresh their perspectives on their careers.

- While the need for additional space may result in a college level analysis of space allocation, every effort should be made to keep the Plant Pathology research and extension faculty in the Plant Sciences Building.

Implementation Plan

UK Program Review Implementation Plan

*This **required** form is described as Appendix A in AR II-I.0.6.*

College/Unit: CAFE Department of Plant Pathology **Date:** 2/11/2016

Recommendation/ Suggestion	Source I/E/H*	Accept/ Reject**	Unit Response (resulting goal or objective)	Actions (including needed resources)	Time Line
1. Create two new Regular Title Series tenure-track faculty lines in the department.	I, E	Accept	The department will make proposals to the administration for new faculty hires in the Regular Title Series, to strengthen and broaden the current areas of excellence.	New recurrent funding to support new faculty lines.	3 years
2. Identify relevant laboratory space for the new faculty hires.	I	Accept	The department will make a request of the administration to identify space, preferably in PSB, for two laboratories (wet or computer) in connection with new faculty hires.	Space must be identified.	3 years
3. Provide startup funds for the new faculty hires, including adequate funds for major equipment.	I	Accept	The department will request of the administration startup funds for two new faculty hires.	$1.2 million ($0.6 million each hire), nonrecurring	4 years
4. Replace plant growth chambers with current, more efficient models, particularly in the containment suite.	I	Accept	Containment chambers are 13 years old and frequently in need of repair. More space-efficient models are now available. So, with growth chamber space at a premium, 3 of the 4 large chambers in the containment suite should be replaced.	Estimated $460,000 for complete replacement, nonrecurring	3 years
5. Utilize institutional resources that have been implemented to help increase applications from traditionally underrepresented minorities.	I	Accept	The Department will increase involvement in programs such as MANRRS and workshops to enhance visibility to underserved minorities. Depending on availability of funds, the department will support one or two undergraduate interns from institutions that traditionally teach underserved minorities (see recommendation 10b).	See recommendation 10b, below.	6 years

6. Develop a comprehensive graduate student orientation program for both domestic and international students.	E	Accept	Of paramount importance are writing and presentation skills and proficiency with key software (Microsoft Office Suite, Endnote, Adobe Acrobat, Illustrator and Photoshop are licensed for use in the University). For the past 4 years, a 1-credit hour graduate orientation course has been taught to new students in their first semester to introduce pertinent skills and information. The Department will coordinate this course with exercises in the first-year required courses, PPA 500 and PPA 600, to ensure that such skills are reinforced by practice. The seminar course, PPA 770, will also be employed to enhance student skills, and students will be informed of GS and other courses (e.g., ENG 098) that can improved their skill set.	Intention is to accomplish this objective with available teaching resources.	6 years
7. Promote an active social committee to foster interactions among all members of the department.	E	Accept	The Association of Plant Pathology Scholars (APPS) is the Department's organization of students and postdocs. The Department faculty and staff will collaborate with the existing Association of Plant Pathology Scholars (APPS) to organize at least two major social events per year, and a program retreat every two years.	Recurring annual budget of $2,500 for departmental graduate-program retreat	6 years
8. Develop plans to promote travel to professional meetings by all graduate students in the department.	E	Accept	Participation and presentations at meetings provides several critically important enhancements to student education, motivation, and future career prospects. The Department recognizes the crucial need for students to participate and present at meetings, and will strive to ensure that every student does so at least once every two years. Travel funds administered by the department will be provided to students on a competitive basis.	Recurring annual $2,500 budget for Departmental travel scholarships.	6 years

9. Examine new sources of funding to support in-state travel for extension faculty and develop plans with the Associate Dean for Extension to adequately fund the extension programs within the department.	E	Accept	This is the subject of an ongoing discussion within the PPA Extension group and with the Associate Dean.	Recurring annual budget of $10,000 per year to support in-state travel for four Specialists and two Associates	6 years
10a. The Plant Pathology faculty should discuss a proposal to provide some financial support for undergraduate (ABT) research projects with the college administration. This could serve as a positive incentive for faculty mentoring of students in the ABT program.	E	Reject	Resources to support ABT interns have not generally been limiting, and the Department has more pressing needs for financial assistance. The Department counterproposal is presented below.	N/A	N/A
10b. The Department should discuss with the college administration possible financial support for undergraduate research projects, where such support can aid in graduate student recruitment directed towards underserved minorities.	I	Accept	Bringing in undergraduates from traditionally underserved communities can help recruitment efforts aimed at increasing student diversity.	Recurring annual budget of $20,000 to support stipend and housing for two undergraduate interns from underserved communities	6 years
11. Encourage faculty to take sabbatical leaves to improve their skill sets and refresh their perspectives on their careers.	E	Accept	The University and the College are generally encouraging of sabbaticals, and, with approval, typically provide full salary support throughout a 6-month sabbatical, or half support throughout a 12-month sabbatical. Often faculty members are unable to avail themselves of the opportunity for personal reasons, such as when it is impractical for spouses and/or children to travel for extended periods. Nevertheless, the faculty will continue to be reminded to consider sabbatical possibilities. The chair and administration should consider appropriate recognition, viz. merit evaluations, for such activities particularly when the faculty member garners funds (e.g., Fulbright awards) for the purpose.	No additional resources	6 years

12. While the need for additional space may result in a college level analysis of space allocation, every effort should be made to keep the Plant Pathology research and extension faculty in the Plant Sciences Building.	E	Accept	The department will work with the administration in an effort to maintain physical cohesion of the department.	New space may need to be identified or constructed.	6 years
13. Due to the recent relocation of the Advanced Genetic Technologies Center (AGTC) facility to the Medical Center, the Plant Pathology faculty may consider developing graduate student workshops to address the loss of the hands-on experiences that were provided by AGTC staff.	E	Reject	The AGTC was a resource developed for the benefit of the university as a whole. In connection with AGTC, one of the Plant Pathology faculty members took primary responsibility for annual workshops each of the past four years. Resources to do so were provided by various grants that had at least a partial objective of supporting AGTC. With AGTC dissolved, the potential for such financial support has also dissolved. Therefore, developing such workshops would be a major drain on time and finances, and compelling any faculty members to do so could undermine their programs.	N/A	N/A

*** Source of Recommendation (I = Internal recommendation; E = External Review Committee recommendation; H = Unit Head recommendation)**
**** Accept/Reject Recommendation (A=Accept; R=Reject)**

Unit Head Signature: _____ **Unit Head Supervisor Signature:** _____ **Date:** _____