Academic Quality Assessment and Development

Department of Plant, Soil and Insect Sciences

2007

Table of Contents

List of Tables

List of Appendices

SUMMARY

The Department of Plant, Soil, & Insect Sciences is the result of a 2003 merger between the former Departments of Plant and Soil Sciences and Entomology. Its 32-member faculty cover a wide array of disciplines ranging from the molecular level to population/community and ecosystem levels of organization. The Department currently has 130 FTEs majoring at the undergraduate level and almost 250 FTE undergraduate non-majors, indicating a significant contribution to undergraduate education at the University. At the graduate level we presently have 29 FTE majors and instruct an additional 15 FTEs non-PSIS graduate students. Total enrollment in PSIS courses was 402 FTE's, the highest in the college. The Department generated $3,366,260 ($105,196 per faculty member) in outside funding from 88 funded grant projects in FY 2007. The faculty had a strong publication record with an average of 2.5 papers published in the upper 50% of peer-reviewed scientific journals as listed by ISI's Web of Science for the 2006 calendar year. PSIS faculty published in a wide range of leading journals ranging from the Agronomy Journal to the Canadian Journal of Zoology, reflecting the diverse nature of our Department. This is in addition to a large number of extension papers, pamphlets and fact sheets produced by faculty with Extension affiliations. PSIS faculty served on 18 editorial boards, either as an editor or associate editor.

During the AQAD self-study, the Department identified two intertwined issues as critical to our long-term success. The first issue relates to the lack of high-quality space for current and especially new faculty. During the last four years, we have hired outstanding faculty members with significant accomplishments and tremendous potential as scientists. It took the Department and College much time and frustration, as well as significant outlays of money to equip the new faculty with laboratories that permit cutting-edge research. The Department is spread over 7 buildings across campus, the oldest one dating from the late 1880's and the most modern originating from the early 1960's. Most of our facilities have never been updated and most spaces do not meet even the minimal needs of modern research laboratories. Our highest priority is the construction of a new building that will allow the faculty and their replacements with state-of-the-art facilities. Currently, a move is underway by the University administration to look at our Departmental needs, and to evaluate the costs of updating or replacing existing facilities. As a result of these reviews, a total of $8,000,000 has been earmarked for the construction of state-of-the-art greenhouses to replace facilities that are over fifty years old.

Our second area of concern is our ability to attract top candidates to this academic institution. During the last 5 years we have had excellent results in hiring top-notch faculty, who have demonstrated remarkable patience waiting for their space to be renovated. To consummate the vision and administrative rationale of the 2003 merger, we designed an ambitious hiring program to bridge our diverse research priorities as we replace retiring faculty, and perhaps gain positions with the University's 250 hiring plan. Once the quality of research space is achieved to fill these positions, the Department will have a bright future to serve the needs of the Commonwealth and the nation.

I. Introduction

The Department of Plant, Soil, & Insect Sciences (PSIS) was created in 2003 through amalgamation of the Departments of Entomology and Plant & Soil Sciences. The original Plant & Soil Sciences Department was itself created in 1964 as a merger of the Departments of Agronomy and Horticulture, which included floriculture, olericulture, and pomology. The Department also includes several plant pathologists who transferred from the Microbiology Department to PSIS when the new department was formed. These individuals previously served as faculty members in the Department of Plant Pathology which was disbanded in 1996 after remaining faculty members were transferred to microbiology.

The administrative rationale of the 2003 merger was that our programs showed complementary strengths, such that their synthesis could result in a more effective and prominent department. A division structure was developed to protect minority interests and to achieve a greater likelihood of such a multi-disciplinary synthesis. The merger document approved by the faculty and college administration is attached as Appendix 1. An additional reason for the merger was the potential of financial savings with a simplified administrative configuration. This was especially important during the state's budgetary crises in 2003 and 1004, when the Department lost over $350,000 of its state funding.

With the exception of Veterinary and Animal Sciences, PSIS includes most teaching, research and outreach programs typically associated with a land-grant institution. With 32 faculty members, it also is the largest and most diverse of the departments within the College of Natural Resources and the Environment. Faculty expertise within PSIS ranges from the molecular to the population/community and ecosystem levels of organization, uniting basic and applied research perspectives. A listing of departmental faculty, their specialties, and demographics is provided in Tables 1 and 2, respectively.

The Department maintains diverse research and educational facilities, including an orchard, an agronomy/vegetable farm, a turf farm, three greenhouse ranges, and a large number of research laboratories. The Department currently includes 28 faculty full-time equivalents (FTE's) for teaching and research. The remaining four faculty FTE's and 16 extension educators provide outreach in support of agriculture through ten Agriculture and Landscape Program teams.

The last formal review of Entomology was conducted in 1998 and Plant & Soil Sciences had their last review circa 1983. There is no record of implementation of the recommendations of those reviews beyond the recommendation to retain Entomology as a separate department. The severe budget crisis in 2002 and 2003 necessitated a merger with Plant and Soil Sciences. Since PSIS is an entirely new Department, most of the old recommendations probably are not applicable to our new department. Organizationally, the department is comprised of two divisions: Entomology and Plant & Soil Sciences, corresponding to the two independent graduate programs. Each year the faculty within each division elects a chair, who represents the Division on the Executive Committee which in turn serves as an advisory body to the Department Head. Various faculty committees serve in either advisory or

policy-setting roles in academic matters. The administrative offices of the Department Head and 4-member administrative staff is in Fernald Hall.

At the undergraduate level the Department has one common four-year major (Plant & Soil Sciences) with an enrollment of around 130 students. We also contribute significantly to the instructional program in the two-year Stockbridge School of Agriculture. Our four-year program offers several concentrations including sustainable agriculture, ornamental horticulture, soil science, and turf management, with emphases ranging from the basic to the applied. Nearly half of our students major in turf management. That, combined with the turf program in the Stockbridge School, places our turf program among the preeminent turf-science programs in the nation. Our turf instructional program is also the oldest continuously operating turf program in the country, starting with a greenkeeper's course in 1927. In addition to the four-year undergraduate major, the Department offers separate minors in Entomology, Plant Pathology, and Plant & Soil Sciences, respectively. The undergraduate curriculum is currently under review, including consideration of new majors or concentrations that reorganize our current concentrations, as well as adding general ecology and biotechnology programs.

At the graduate level, each Division has its own major, with13 graduate students in Entomology and 48 graduate students in Plant and Soils. The Divisions have separate graduate policy committees and Graduate Program Directors. Many Entomology students are pursuing joint degrees with interdisciplinary graduate programs including Organismic and Evolutionary Biology, and Plant Biology, reflecting their interest in uniting basic and applied research perspectives. Most of the Plant & Soils graduate students are focusing on soil science, although some are also enrolled in the interdisciplinary Plant Biology program.

Initial action on the current self review started in the spring of 2006, followed by an update and more thorough review in March and April of 2007. This document first identifies key issues facing the Department, followed by responses generated during the self study. Most of the latter is based on data provided by the UMass Office of Institutional Research, the University's Office of Grant and Contract Administration, various data bases focusing on faculty publications, and information gathered during the 2006 benchmarking cycle.

I.1. The Department

The mission of the Department is *to conduct integrative research that spans the range from basic to the applied, from molecules to ecosystems, and from biotic to abiotic systems, including plants, insects, pathogens, soil, air and water*. Our integrative approach positions us to help the University of Massachusetts Amherst and the College of Natural Resources and the Environment fulfill their land-grant responsibilities by promoting economic development and solving problems in agriculture, urban horticulture, forests, and other natural ecosystems. Our Department addresses some of the Commonwealth's most pressing concerns in environmental protection, human health and agricultural production while conducting internationally recognized basic research in ecology, evolution, molecular biology, and environmental chemistry.

We believe that we can best fulfill our mission with research programs that integrate basic and applied studies. Applied work benefits by close association with basic science which provides the latest in new ideas and techniques, which can be used to solve applied problems in novel ways. Basic science is enriched by addressing applied problems that serve our communities and provide opportunities for

future funding. In our research we respond to the specific nature of the Massachusetts' forested, suburban/urban and agricultural landscape and economy. Some of our scientists work on crops such as cranberries, vegetables, forage and fruit, which are mainstays of the Massachusetts agricultural economy. Others work on problems related to the green industry and the urban/suburban habitat such as turf, shade trees, urban horticulture, Lyme disease, and soil remediation. We plan to maintain our commitment to work in these areas, but will focus our faculty hiring on integrative positions that unite our diverse perspectives while incorporating biotechnology, environmental protection and growth industries of the future. The diversity of our Department helps promote multi-disciplinary research among faculty with different research expertise. This increases the likelihood of receiving competitive funding from federal and private agencies.

I.2. Key Issues

Space: The number one issue facing our Department is the quality and condition of our research space. Without hyperbole, we believe that we now face a crisis situation. Our facilities are so outdated and funding for renovation so limited that it is very difficult, if not impossible, to provide our new faculty with appropriate facilities. Renovations promised to new faculty have taken up to two years to complete, and many existing laboratories face long-standing problems with temperature regulation, electric power supply, and dust and fungi in decaying and obsolete buildings. The deplorable condition of our existing space provides the greatest detriment to the maintenance of Departmental research quality, let alone our ability to compete effectively in the emerging and rapidly growing research arenas of the coming generation. Departmentally controlled teaching spaces are perhaps just as inferior with little if any high quality laboratory space available for modern courses.

Our Department is spread over seven different buildings ranging from Clark (1 faculty; year of construction: 1907), Fernald (9 faculty; 1910) and French (8 faculty; 1909) on the east side of campus, to West Experiment Station (1 staff; 1887), Stockbridge (6 faculty; 1914) and Hatch Laboratory (1 faculty; 1891) in the center portion, to Agricultural Engineering (4 faculty; 1956) and Bowditch (5 faculty; 1963) on the west side of campus. This dispersion throughout the campus poses a significant impediment to interdisciplinary and intradepartmental research, as well as to the general morale and comradery needed among both faculty and students for this merged department to function effectively.

Our space limitations make it especially difficult to realize the administrative rationale for merging the Departments of Plant & Soil Sciences and Entomology. Several years ago the College initiated a review to assess the possibility for a new building on the west side of campus. Unfortunately, the financial resources were lacking at that time. We remain optimistic about the new state capital-improvement plan which includes a significant allocation to the UMass system for capital improvement. In order for our Department to grow and prosper and to permit our College to remain competitive in core areas of its mission, we need modern laboratory and teaching facilities located in a single area.

New Faculty: Over one-third of the current faculty will retire during the next decade. This provides an excellent opportunity to reevaluate the needs of PSIS in teaching, research and, outreach. We anticipate new faculty positions as faculty retire, which we will use to support the basic underpinnings of our evolving undergraduate and graduate programs and to help bridge our diverse research interests. Other openings may become available through the university's 250 hiring initiative which we will use to incorporate relevant new and emerging fields of study into our teaching and research programs.

A common threat for most of the hires is a strong departmental interest in ecology. While we intend to retain our traditional interest in basic plant, insect, and soil related disciplines, a significant number of vacancies will be filled in disciplines related to genomics and other biotechnology fields. A detailed hiring plan is presented in section VI.3. The sequencing of hiring new faculty depends on which position is being vacated. Some of these vacancies are basic to existing programs while other openings will be filled with disciplines more closely associated with innovative biotechnological areas.

II. INSTRUCTION

PSIS faculty generally have balanced instructional, research and extension task assignments, although some faculty may have heavier teaching loads than others who may be focused more on research or outreach. To develop a common response to the self-study questions formally posed as part of the AQAD review, we decided to provide separate evaluations with respect to teaching, research and extension. These responses are presented on the following pages. AQAD questions are in bold print, whereas the response is in regular font.

II.1. Programs shall ensure that curriculum is relevant, rigorous, current and coherent. How does the Program determine curricular content? How does the curriculum relate to current existing standards, if any, of the discipline?

The Department has three standing committees to examine curricular content. The Undergraduate Policy Committee focuses on the Department's undergraduate curriculum. This committee periodically examines undergraduate (100-500 level) course offerings and makes recommendations to the faculty for modifying curriculum structure and content. The Department has separate Graduate Policy Committees for the two divisions making recommendations to the faculty regarding the separate graduate curriculum and the content of our 500-800 level courses.

PSIS has faculty in various disciplines, including agronomy, biotechnology, entomology, horticulture, plant pathology, and soil science. To ensure that the Program's curriculum conforms to current standards in each of these disciplines, the Department Head periodically charges *ad hoc* committees with making recommendations for changing the content of specific courses, eliminating obsolete courses, and proposing new courses.

The foundation of the Plant & Soil Sciences graduate program relies mostly on curriculum taken during the student's undergraduate years. We do require that students have at least two semesters of statistics during their academic career. Specific course requirements are decided upon during a meeting with the student's examination/guidance committee. In addition, the following requirements apply: one course each on seminar preparation and presentation, required attendance at a minimum of two departmental semester seminars, pass an oral qualifying exam (PhD level only), as well as a final examination, and to make a public presentation of his/her research results.

The Entomology graduate program considers two courses (Insect Structure and Function, and Insect Systematics) as essential foundation courses. Each student's dissertation/thesis committee bears the responsibility to determine additional course requirements, tailored to that student's specialty. This model is new to the Entomology graduate program, but has been well tested and is very successful in the Organismic & Evolutionary Biology program. Beyond core courses, each Ph.D. student must pass an oral qualifying exam and prepare a grant proposal suitable for submission to competitive funding

programs. The proposal may form the basis for a formal NSF-DDIG grant proposal. Each spring, the Entomology faculty as a whole conducts a graduate student review, during which each student's program is carefully examined. At this time, suggestions are made for deadlines and specific requirements of the graduate school for each student are monitored.

II.2. What internal or external measures of review are employed to ensure that the curriculum is relevant and up-to-date?

The Undergraduate Policy Committee (UPC), the Graduate Policy Committees (GPC), and various previously described *ad hoc* committees serve as internal review panels to ensure that the curriculum is relevant and up-to-date. The Department has a well-established procedure for examining and approving new course proposals. New courses at the 100-500 level must be approved by the UPC. Similarly, new courses at the 500+ level must be approved by the GPC of each division. The UPC, comprised of members across a wide variety of disciplines, meets on a regular basis as needed to review course proposals and discuss curriculum issues.

In the Entomology Division it is up to the Examination/Guidance Committee to determine what the overarching set of courses will be for a particular student. Students are encouraged to talk amongst themselves, to discover exceptional courses that will provide excellent training in key areas. Equally, they are also encouraged through such discussions to identify courses that might be tangential to their interests, not up to date, or poorly taught, and with their Committee's approval, to seek other course opportunities. Oversight of the process occurs during the spring Graduate Review, which is an annual review of each student's status and progress by the faculty as a whole.

The Plant and Soil Sciences Division's GPC is in charge of setting degree requirements at the graduate level. In addition to academic requirements set by the Graduate School, the committee assesses the need to update curriculum. The committee also doubles as admissions committee, screening applications and evaluating how prospective students fit in the Department. Selection is based on undergraduate record, maturity, experience and whether or not the student's interests coincide with the interests of Departmental faculty. Students in both divisions can be offered either Teaching Assistantships (TAs) or Research Assistantships (RAs). The latter are subject to availability of grant funds. TA's are assigned based on the area of study and the potential as an instructor. To ensure academic rigor, the course selection is determined by the Examination/Guidance Committee in collaboration with the student and focusing on the student's area of interest.

Periodically, the Department is subjected to an external review by a panel of faculty and administrators from other academic institutions. Aside from research and extension assessments, these reviews include evaluations of undergraduate and graduate programs and provide recommendations for improving the overall operation of the Department. It should be noted, however, that the last such external review of Entomology occurred in 1998, and that of Plant & Soil Sciences took place in 1983.

II.3. Are the curricular offerings structured in a logical, sequential and coherent manner? Is there an appropriate balance between breadth and depth?

The curriculum is structured in a logical and coherent manner. For example, most Departmental courses at the 100-, 200-, or 300-level are introductory or survey courses designed to introduce undergraduates to basic principles and major concepts for each subject. In contrast, the upper-level (400-800) courses usually have prerequisites to ensure that students have the basic academic training for advanced studies of specialized topics.

The four-year undergraduate major is presently broken into concentrations representing diverging student interests and educational needs. Our concentrations are designed to be most effective in addressing these needs. A significant number of our undergraduate students were previously enrolled in the two-year Stockbridge School of Agriculture which has an applied, hands-on curriculum. Upon graduation and transfer into our four-year program these students, already having a strong applied science background, are most likely to select concentrations that provide training in management skills, needed to succeed in a competitive business world. For example, students interested in joining the green industry (turf and horticulture) typically take an array of business oriented courses rather than focus on the advanced scientific aspects of their area of study. In our science-based concentrations, we aim to provide a solid background in basic sciences including biology, chemistry and physics and expand on these basics during their junior and senior years.

II.4. If consistent with the Program mission, does the curriculum adequately prepare students for further study or employment?

Departmental undergraduates must choose a track option (Science or Business Management) and a concentration area (the current options are General Studies, Ornamental Horticulture, Turf Management, Soil Science, Sustainable Agriculture - Crop Production, or Sustainable Agriculture - Food Systems. Students who obtain a bachelor's degree with a Business Management option are well prepared for employment in their concentration area. Students who obtain a bachelor's degree with a Science option are well prepared for employment or graduate study in their area of concentration. Graduates with M.S. or Ph.D. degrees find employment in their specialized fields in private industry, academic institutions, and government agencies at the local, state or federal level, as well as non-governmental organizations.

Our graduates have done well in obtaining professional positions, as professors at universities, colleges or investigators at state, federal, or private research laboratories. For example, over the last several years, recent Ph.D.s have taken positions at the University of Arizona, Stanford University, Miami University of Ohio, the University of Connecticut Medical School, South Korea University, Michigan State University, North Carolina State University, the World Bank, Post University, the University of California at San Luis Obispo, and the Swiss federal research laboratory in Zürich. In the last two decades, over 90% of the Entomology graduate students have found employment in their field, and over 25% are in academic positions.

II.5. In what way does the Program contribute to the education of students in terms of general knowledge, critical thinking capacity and other essential cognitive skills?

Departmental course offerings provide students with general knowledge about crop production, soil and water resource management, sustainability, integrated pest management, and insect biology. In Departmental courses, students learn to gather and assess relevant information to analyze complex problems, and to think open-mindedly about important and sometimes controversial issues to reach well-reasoned conclusions. Many Departmental courses have laboratory sections where students collect and analyze data and then must interpret the data's significance. Graduate students are expected to conduct original research and are guided by a committee of Graduate Faculty in the appropriate design of experiments and the subsequent analysis and interpretation of data.

Independent thinking is developed in our students by several means, including the following activities:

i. Graduate students must define and carry out research for their degrees. Depending on the source of student funding, the basic topic may already be established for the student by a grant, or not (in the case of students funded as TAs). Many of our students working on grant-funded projects treat the grant-funded objectives as a floor, not a ceiling, and go well beyond the original grant's ideas and objectives.

ii. The oral examination demands that the student be able to think quickly and use the totality of his/her past knowledge to respond analytically and logically to a series of questions, many of which are quite broad in nature.

iii. The Entomology Division requires the student to develop new research ideas in writing at a level suitable for submission to a nationally competitive funding agency (actual submission is encouraged, but not required). This requirement was originally put in place to promote independent thinking by students whose support and research topics have come from already-funded grants. The major advisor is not involved in this process, but proposals go through review by an ad-hoc panel of three faculty, and most proposals are sent back for revision before acceptance. For proposals that students submit for funding, the advisor may become involved once the proposal passes the grant review committee. Students are increasingly using this requirement to develop NSF Doctoral Dissertation Improvement Grants. This activity demands that the student reads widely, synthesizes information in new ways and identify leading-edge issues in science worthy of investigation. We recently started offering a course in grant-writing. The final product of this course will be a grant proposal that meets Division requirements.

iv. Our students frequently present findings of their research in classes, and at regional, national and even international professional meetings.

II.6. Programs shall ensure faculty quality and productivity. Do faculty possess the appropriate background, experience and credentials?

PSIS faculty have all received terminal degrees and extensive training in their respective disciplines. Most of the faculty have outstanding records in teaching, research, and outreach, thus, they are highly respected by their students and peers from both off- and on-campus. Several have received college, university, professional society, and government agency awards for their excellence in advising, teaching, research, and outreach (Autio, Averill, Barker, Bhowmik, Boyle, Bramlage, Ebdon, Green, Han, Herbert, Picking, Porter, Stoffolano, Vittum, Xing) and many collaborate and are recognized by international colleagues (Adler, Autio, Bhowmik, Craker, Elkinton, Green, Herbert, Manning, Normark, Veneman, Wick, Xing).

II.7. Are faculty current in relation to the knowledge base and content of the discipline and curricular offerings?

The PSIS faculty are at the forefront of research in their own disciplines and frequently update curricular content. They keep themselves updated by attending and organizing conferences and workshops, presenting and reading papers, writing grant proposals and participating in review panels, and by publishing, reviewing and editing journal articles.

III. RESEARCH

We have identified the following major areas of research strength in our Department that represent our unique strength and our vision of where we should focus our investments in the future. We note that these foci are not mutually exclusive and that there is substantial overlap between them. We feel that such overlap strengthens the potential for collaborations amongst faculty and the quality of the research; for example, applied foci such as Sustainable Agriculture and Integrated Pest Management can benefit from the use of molecular tools and biotechnology or from ecological and evolutionary approaches. We use these research areas, listed alphabetically, to identify future hires that will develop independent, extramurally funded research programs that fill gaps in our current department, strengthen and support current faculty research programs via new collaboration, and achieve our goal of integration across research areas that have traditionally been treated separately.

III.1. Ecology, Evolution and Population Biology.

As part of our mission to solve questions across a range of disciplines, faculty in our Department study the basic principles and processes that determine the diversity and abundance of genes, individuals, and species. Fundamental science in this area provides the underpinnings that are necessary to develop management tools as well as to understand how systems function at multiple levels. Our faculty have published in the top ecology and evolution journals, received millions of dollars in competitive grant dollars from NSF, USDA, and NIH, and trained graduate students through the Organismic and Evolutionary Biology graduate program in addition to the Entomology and Plant & Soils graduate programs. Core faculty includes those who study systematics and genome evolution (Rich, Normark, Porter), population ecology of insects and plants (Elkinton, Adler), population genetics (Porter), human diseases vectored by insects (Rich), behavioral ecology (Averill), and the ecology and evolution of plant pathogens, fungi and microbes (Cooley, Jung, Manning, Simkins). Research takes place across a range of environments, including natural, agricultural, and urban habitats. New hires in ecosystem ecology, soil ecology, insect-microbe interactions, invasive plants, and plant metabolics/proteomics will provide collaborations that strengthen the research of existing faculty and allow our Department to move into cutting-edge areas of new research in this area.

III.2. Integrated Pest Management, Biological Control and Invasive Species.

The Department has long been recognized as national leader in Integrated Pest Management (IPM), which solves pest problems by maintaining populations at tolerable densities with compatible and environmentally safe techniques. Core faculty include those who work on weeds (Bhowmik), plant pathogens (Cooley, Jung, Wick), vegetables (Adler) and insects (Averill, Burand, Elkinton, Rich, Van Driesche, and Vittum). Extension educators include Childs, Hazzard, Schloeman, Smith, and Swanson, who work closely with growers and conduct applied studies to develop and fine tune management options. This research takes place in agricultural crops, forests and in the urban/suburban landscape. The Department is recognized internationally for leadership in Biological Control, an important dimension of IPM that involves the use of natural enemies to maintain pest populations at acceptably low densities. Work is done on biological control in greenhouses and ornamental crops (Van Driesche, Smith), and forest and shade tree habitats (Elkinton and Van Driesche). Each year we face new invasions of non-native plants, insects and other animals brought about by the ever increasing volume of world trade and travel. Coping with these invasive species has been and will continue to be a major challenge and an important source of funding for the Department. New faculty positions in ornamental plant entomology, invasive pathogens and invasive plant ecology would contribute to this area of

strength. New hires in soil ecology and insect-microbe interactions also may expand our research in this area.

III.3. Molecular Biology and Biotechnology.

Modern biology has been revolutionized by a vast expansion of knowledge and techniques at the cellular and molecular level. Molecular biology and genetics has opened the field of biotechnology. Many new molecular biology technologies along with techniques and ideas from genetics, biochemistry and biophysics have been developed and utilized for understanding of biological processes. Biotechnology including recombinant DNA technology, has had an enormous impact on modern agriculture in the form of crop plants engineered with novel genes that protect them against herbicides, insect and disease attacks, and other forms of stress. It has spawned new ways to produce medicines, hormones and bioenergy for the benefit of humankind. Furthermore, biotechnology comprises other areas such as molecular diagnostics, cell biology, and informatics. Particularly, DNA marker technology has been extensively used for the genetic improvement of plants via DNA fingerprinting for variety distinction and protection, marker-assisted selection for quantitative traits, gene discovery, and the analysis of genome structure and function. Several members of our Department focus their research on molecular biology and biotechnology, including Burand (insect virology), Jung (molecular population structure of turfgrass pathogens and comparative genomics of grasses), Normark (molecular systematics), Parkash (plant genetic engineering, phytoremediation of contaminated soil, water and air) and Rich (genetics and evolution of zoonotic diseases). These individuals use a wide array of molecular techniques to solve applied problems and answer basic science questions. They interact and collaborate with colleagues in Biochemistry, Microbiology, Veterinary and Animal Sciences, Biology, Plant Biology, and Molecular and Cellular Biology. In addition, the University Genomics and Bioinformatics Facility is currently housed and operated in our Department, making it a center for this kind of research on our campus. New faculty hires in insect physiology, insect genomics, plant metabolics/proteomics, and plant functional genomics will further strengthen this research area.

III.4. Soil and the Environment.

This is an excellent research program in the Department and strong in graduate student training. This program has a cohesive research and educational effort focusing on preservation and improvement of environmental quality, including soil, water, and air. Eight members of the faculty (Barker, Bhowmik, Herbert, Manning, Parkash, Picking, Simkins, Veneman, and Xing) and two extension educators (Bodine and Hashemi) form the nucleus of this group. Together, they attract a significant amount of research dollars and have the majority of graduate students in the Department. Many of the faculty members serve as the journal editors and/or editorial board members. Research topics in this program span from molecular (e.g., spectroscopic examination of pollutant binding) to ecosystem level (e.g., wetland protection and restoration), range from basic (e.g., natural organic matter chemistry) to applied research (e.g., pesticide and nutrient management, soil remediation), and cover chemistry (e.g., sorption of pollutants) to biology (e.g., genetically modified plants for soil remediation). This program is internationally recognized and attracts visiting scholars from all over the world (e.g., Italy, Brazil, Israel, China, and Germany). This research program is also productive, particularly in the area of environmental/soil chemistry. The program's goal is to enhance excellence and become a world leader in environmental and soil research and graduate student education. New faculty positions in soil

physics and vadose zone modeling, soil ecology, ecosystem ecology and environmental aquatic chemistry will help assure our leadership in this area.

III.5. Sustainable Agriculture.
This program has a broad scope of activities involving nearly all production of food and forage crops in Massachusetts and addressing nearly all production systems which may enhance economic and environmental sustainability. The core of the program includes 14 members of the faculty (Adler, Autio, Averill, Barker, Bernatzky, Bhowmik, Cooley, Craker, Gerber, Greene, Herbert, Mangan, Van Driesche, and Wick) and seven extension educators (Bonanno, Bodine, Clements, Hashemi, Hazzard, and Schloeman). The Fruit Program has a particularly effective connection with the fruit growers in Massachusetts. The connection has resulted in significant resources contributed to the University from stakeholders, most notably a 215-acre farm in Belchertown to house the University's fruit research. Stakeholders currently lead development efforts to ensure the future financial support of the fruit research farm and faculty positions in fruit crops. Three members of the faculty (Autio, Cooley, and Greene) form the core of the fruit program, and a future endowed position (Fruit IPM) will further support this economically important area. Our Vegetable Program is recognized as a leader in researching new vegetable crops to serve the region's growing ethnic communities while opening new market opportunities to growers (Mangan) and in development of organic and IPM systems (Hazzard). The Cranberry Program, based at the Cranberry Station in East Wareham is the foremost center of cranberry research in the nation. Cranberries are the most valuable cash crop in the Commonwealth and the highly supportive stakeholders view Station research as vital to the cranberry industry's viability. PSIS faculty or adjunct faculty conduct disciplinary studies on pathogens (Caruso), nutrition (Demoranville), weeds (Sandler) and insects (Averill) and also work as a team to promote ecological and efficient cranberry production. Other faculty work on forage crops and pasture systems (Herbert). We propose new positions to move into the forefront of research in the biological and ecological underpinnings of sustainable agricultural systems (plant functional genomics, plant metabolics/proteomics, soil ecology, and ecosystem ecology).

III.6. Turf Science and Urban Horticulture.
The Turfgrass Program contributes significantly to the teaching, research, and outreach missions of the Division. The Program's goals are to enhance its already considerable national reputation in undergraduate education in the turfgrass sciences, as well as to become one of the leading turfgrass programs in applied/basic research, outreach, and graduate education. Our turfgrass faculty work on a wide array of basic and applied research projects, ranging from product evaluations for immediate clientele recommendations to understanding physiological, genetic, and molecular mechanisms of biotic and abiotic stresses. The ultimate goal is breeding turfgrass cultivars with improved disease and insect resistance and tolerance to abiotic stresses, the most environmentally sound management strategy. The current program consists of six faculty members (Bhowmik, DaCosta, Ebdon, Jung, Vittum, and Wick). The Joseph Troll Turf Research Center at South Deerfield, MA was dedicated on November 1, 2005. The facility has 18 acres of research plots, a 3,000 square-foot teaching and research building with a state-of-the-art laboratory supporting on-site research, a conference room, and an equipment and maintenance area. This is a result of the strong partnership between the college and the turf industry, including professional turf associations, industry leaders, alumni, and golf course superintendents.

The Urban Horticulture Program in the Department through UMass Extension has provided technical services to environmental horticulture businesses for many years. Former Chancellor Lombardi and former Dean Willis identified urban audiences and programs as central to the future success of the University. In Massachusetts it is estimated that more than 90% of the population lives in suburbia or cities. The program has support from five faculty (Elkinton, Cox, Han, Van Driesche, Wick) and seven extension educators (Carroll, Childs, Clark, Lopes, Prostak, Smith, Swanson). New hires in ornamental plant entomology, invasive plant pathogens and invasive plant ecology would enhance our research in this area.

IV. Extension/Outreach

IV.1. What is the Program's mission and is it clearly aligned with the campus mission and direction?

The mission of UMass Extension is *to improve the health, well-being, and security of youth, families, and communities; conserve and enhance natural resources; and strengthen agriculture and food systems*. We fulfill our mission by utilizing the research and teaching capacity of the University of Massachusetts-Amherst to generate and communicate knowledge while creating approaches, methods, and tools for solving problems. UMass Extension links the university with a larger community of people in collaborative partnerships to address issues of fundamental importance to the people of Massachusetts, New England, and the nation. The mission of the Agriculture and Landscape Program within UMass Extension is even more closely aligned with the teaching and research activities of PSIS.

PSIS has several faculty members who carry significant Extension appointments, some serving as Extension program leaders. In addition, there are several Extension Professionals who also may serve as program leaders, often with specific commodity assignments. All Extension personnel within the Department are in the Agriculture and Landscape Program, but several also collaborate with people in other programs, including Nutrition Education, Natural Resources and Environmental Conservation, and 4H. Members of the Extension faculty are expected to teach within the university curriculum, and most teach at least one service course that is designed to serve students in a specific commodity. Some Extension Professionals also teach in a traditional classroom setting, but current federal guidelines make it difficult for them to do so. Compensation is awarded to individual programs based on the degree of participation.

It is difficult to address most of the topics and questions described in the "self-study guide" for the campus academic quality and assessment development because much of the activity carried out by Extension Educators in the department is not directly related to the formal academic curriculum of the university. UMass Extension provides educational information in a variety of forms to clientele, including traditional agricultural producers, landscapers, athletic field managers, golf course superintendents, and watershed management authorities. Much of that information is presented in educational seminars or "hands-on" training sessions. While many of these contacts are not considered traditional classroom "teaching", Extension Educators are gifted communicators and very effective teachers. The self-study process recognizes the value of UMass Extension teaching in all its forms.

UMass Extension is a very efficient and critical part of the Land Grant mission of the University of Massachusetts, and is generally regarded as one of the best Extension programs in New England. In many programs, UMass Extension personnel provide leadership across the entire region for their commodities (e.g., cranberries, floriculture, tree fruit, turf, and vegetables).

IV.2. What internal or external measures of review are employed to ensure that the Program is relevant and up-to-date?

Each Extension team leader in the Agriculture and Landscape program creates an annual Plan of Work (POW) and must report on the various assessment tools at the end of the fiscal year. The POWs are reviewed by team leaders and Extension administrators to ensure that programs are innovative, address critical agricultural, economic, and environmental issues; and are responsive to changes in the industries and the Commonwealth. The "Extension Curriculum" might be considered to be the collection of seminars, industry-wide conferences, and grower meetings that are presented each year. The content of those presentations changes constantly, addressing new areas of interest or concern as they arise.

Attendees are asked to complete evaluations at the conclusion of most Extension programs, and their suggestions for improvement are incorporated in subsequent presentations or programs. Constituents consistently indicate that the content and direction of the programs matches their interests and concerns.

IV.3. How does the Program determine curricular content?

For the most part, UMass Extension determines its "curricular content" (as defined in the preceding paragraph) as a direct result of input from clients. Each team in the Agriculture and Landscape program maintains an advisory board, consisting of business leaders from key elements of that commodity. The team meets with the advisory board at least once a year and invites input throughout the year.

IV.4. Do faculty possess the appropriate background, experience, and credentials?

The Extension faculty in PSIS are well trained in their disciplines and are very effective communicators with their clientele. They do an excellent job of remaining current in their knowledge of their own disciplines and curricular offerings.

The area not addressed in this AQAD process is the role of Extension Educators in the Department. We believe these professionals are an underappreciated resource and we would welcome better integration of these individuals into the department. Some of them already teach traditional classes, and others are very active in training (and funding) graduate students. They are constantly seeking new ways to provide traditional and non-traditional curriculum to educate the next generation of agricultural and horticultural professionals.

There are several suggestions for integrating Extension Educators into the Department more effectively. The Department already invites Extension Educators First to faculty meetings regularly, but at least once each semester there should be several items on the agenda of specific interest to them. There should also be a clear policy regarding voting privileges at the faculty meetings – for example, which items would Extension Educators be allowed to vote on? Extension Educators

should be invited to serve on academic committees. This can be a double-edged sword, because the time spent on the committee is time that is unavailable for other duties. Some effort should be made to educate the non-Extension faculty members within the department about the skills our Extension Educators have in delivering information from the university to the citizens of the Commonwealth. It may well be that our Extension infrastructure could be very effective at sharing information about the very exciting research being conducted within our department. Finally, a mechanism for recognizing and rewarding Extension Professionals who are teaching in the traditional classroom must be developed.

IV.5. Are the program expectations for faculty involvement in teaching, research/ professional/creative activity, and public service/academic outreach activities appropriate; and how are these expectations met?

While the university continues to promote the concept that research, teaching and outreach are equally important and carry equal weight in the tenure and promotion regimen, in fact it is sometimes difficult for an individual with a significant Extension appointment to be promoted or fare well in the merit process without conducting a significant amount of traditional research, regardless of the formal time assignment. The latter is not a serious problem in our Department since the top merit awards the last three years have often gone to faculty with significant extension appointments.

A quick perusal of the annual faculty report (AFR) will show that the 17-page document includes three pages for entering supporting documentation for "teaching and advising", six pages for "research, creative or professional activity", and four pages for "service" (primarily college and university committees and activity in professional associations). Most of the remaining pages are for comments from department head, dean, personnel committee, and so on. There is no section designated specifically for outreach or extension. The only avenue to enter "Outreach/Extension" activities in the AFR is in Section IV-D, under "other professional service activities or accomplishments not adequately covered in any of the previous sections", or to compartmentalize documentation in the Research and Teaching sections. This format sends a very negative message to faculty members with significant Extension appointments.

IV.6. In what ways does Program faculty lend its professional expertise to off-campus constituencies?

This is the very essence of the UMass Extension Program. Many of the Extension personnel in the Agriculture and Landscape program are housed in PSIS, and are very interactive with clientele in their areas of expertise. Extension personnel (including faculty and professional staff) make site visits, discuss problems by telephone or electronic mail, develop training materials and commercial recommendations (for crop production, soil management, pest management, business plans, and many other things), produce and distribute newsletters throughout the growing season, and provide timely management updates on web-pages. Some members of the faculty (and several Extension Educators) are involved in diagnosing plant problems. The interactions among growers, Extension personnel, and faculty) regularly contribute to classroom teaching and guide the direction of research efforts. Our Extension personnel are constantly in contact with off-campus constituencies.

IV.7. Programs shall ensure teaching/learning environments that facilitate participants' success.

UMass Extension "teaching" off-campus normally address a wide range of constituents, all aspiring to learn something important to their business. Some of these participants have not been in a classroom for many years and are easily intimidated. Success in Extension training programs might be measured by the survival of a small farm that might not otherwise have been able to make it, or by a grower being encouraged to try a new approach to manage a pest. The overwhelming majority of evaluations that are returned after a training program indicate that the attendee "learned a lot" or "will change a practice" as a result of attending the session. This suggests that our programs are very successful and effective. Students in traditional courses taught by Extension personnel greatly benefit from the opportunity to see and experience "real world" issues. Classes often incorporate field trips to farms and agriculture related sites or for term projects.

IV.8. Programs shall ensure that resources are used wisely.

The current review is of PSIS, but most of the Extension resources are allocated through a different internal administrative route. Most Extension funds are allocated to teams within a specific program. In the case of Agriculture and Landscape, the process is transparent and team leaders are able to articulate their needs to the Program leader. The program has become much more active in the last two years in seeking outside funding support, including outright gifts and grants. For example, the Turf Program has been the beneficiary of nearly $1 million raised in the past two years, primarily to construct a new research facility in South Deerfield, Mass. The Tree Fruit program has raised a similar amount and is poised to seek funds to endow a professorship. These initiatives come from within commodities and benefit Extension along with research and teaching in those areas. It should be noted that NRE college leaders were essential in securing these resources.

V. FACULTY PERFORMANCE AND DEVELOPMENT

V.1. Are the program expectations for faculty involvement in teaching, research/professional/ creative activity, and public service/academic outreach activities appropriate; and how are these expectations met? Are these expectations consistent with program polices regarding teaching assignments, merit allocations, and other aspects of faculty roles and rewards?

PSIS faculty often have large teaching loads in addition to their research and outreach programs. The average number of classes per faculty member is 1.8 per year, with some as low as 0.8 and others teaching more than 4 classes per year (see Table 3). Instructional expectations and time commitments have increased during the past 10 years, partly resulting from faculty retirements and attrition. In some cases, courses are no longer offered, whereas other courses, essential to programmatic needs, have been reassigned to other faculty. Courses are assigned by the Department Head after receiving faculty input. Each semester, the Head solicits requests for teaching assistants. TA's are assigned on the basis of class size, number of laboratory sessions and demonstrated need. Most TA's are graduate level students, but in some introductory classes undergraduate students may be employed, particularly for grading and laboratory preparation. In accordance with university policy faculty complete an Annual Faculty Report (AFR) in the fall of each year. The performance of each faculty member is summarized in separate statements by the Departmental Personnel Committee (DPC) and the Head. Performance is determined on the basis of the completed AFR, including contributions in teaching, productivity of other faculty in similar positions, special awards, teaching loads, amounts of extramural funding, number of publications, and extension and outreach contributions.

The Department Head on occasion meets with individual faculty members to discuss possible deficiencies in performance, and how to refocus teaching, research and outreach efforts to become more productive. Junior faculty, once hired, meets informally on a monthly basis with the Head to ensure that they are on the correct track towards tenure and promotion. During these consultations potential approaches in teaching, research and service are discussed. Successful AFR's and promotion documentation from senior faculty is shared to illustrate excellence in teaching, research, and extension. Junior faculty are encouraged to select a mentor, although this is not always possible.

V.2. In what ways does the program foster professional development and growth of faculty?
The Department practices intra-department mentoring and encourages faculty to attend conferences and workshops, as well as taking sabbatical leave to gain up-to-date knowledge and to further their professional development. The Department should also regularly bring in well-known scientists for seminars and discussion, which will increase our visibility and will benefit teaching, research and outreach. Faculty are encouraged to write grant proposals and scientific papers as this also helps them learn the new trends in research and the current knowledge in a given field.

V.3. In what ways does the program faculty lend its professional expertise - as expressed through teaching and research, scholarly and creative activity - to off-campus constituencies?
In teaching, we offer a Master of Science program to off-campus students and some faculty are developing or considering offering courses on-line. The off-campus students come from various sectors and agencies over New England. Many faculty members are also involved in teaching and training through UMass Extension programs. These outreach programs are offered both in Massachusetts and elsewhere in the Northeast. In research, our expertise is often called upon for advice and suggestions in areas such as soil management, pest management, crop production, soil cleanup, etc. Further, many of our faculty serve their professions as journal editors, editorial board members, peer review panelists, conference organizers. Some faculty members also provide service and help develop policies for local, state and federal government agencies.

V.4. Performance
The Department does a fair job helping to repair existing instruments and facilities. However, the College needs to keep investing in new, advanced instruments and facilities for teaching and conducting modern research. New instruments will enhance our research capability, enhance student learning and improve success of funding applications. As it stands, we have the oldest facilities and buildings on campus. Furthermore, these buildings are scattered over the campus.

Faculty performance can be assessed quantitatively by looking at the number of classes taught, enrollment, student credit hours, number of publications, and number and total amount of grants. A measure of faculty performance is the number of student credit hours. Using data from the UMass Office of Institutional Research a relatively unbiased quantitative measure of faculty performance may be obtained. PSIS faculty teach a range of classes ranging from courses designed for 2-year Stockbridge students to upper level graduate courses. Over the last 7 semesters our faculty taught an average of 1.3 classes a semester, indicating a mean of slightly more then 1 course a semester. There was a significant difference between faculty members, ranging from 0 classes for our most recently hired faculty to 5 courses per year for others. Faculty members who carry such a high teaching load, usually, but not always, are less active in research.

The publication records for the 2004 through 2006 calendar years are presented in Table 4. Data regarding publications are often biased. We selected as a measure of both quantity and quality the number of publications in one of the top 50% journals listed on the Web of Science. The last period (2006 calendar year) for which data is available showed a significant increase in number of publications as compared to the previous year (83 versus 61). This is partly due to the hire of several new faculty, who are just starting their academic career and are not exceptionally productive during the first couple of years. The average number of refereed publications went from 1.9 per FTE in 2005 to 2.5 in 2006. It should be noted that in reality the number of publications of PSIS faculty is a lot greater, perhaps as much as at least twice the number of articles listed in the Web of Science. A number of faculty members have part Extension appointments and these individuals often have an outstanding publication record in applied science publications rather than the refereed papers cited in the Web of Science. Bringing information from the researcher to the field is an important component of outreach, however, it is difficult to come up with on unbiased sample of these types of publications.

Table 5 depicts the total research dollars brought in per fiscal year (7/1 to 6/30). The amounts vary from year to year, but indicate a slight increase in grant money generated in the last couple of years, from $2,633,734 in FY 2005 to $3,029,099 in FY 2007 with an average total of $2,517,818. These years also showed an increased in the mean grant funding generated per faculty member (Table 6) going from $86,145 in FY 2005 to $105.196 in FY 2007, while the number of grants increased from 79 in FY 2005 to 88 in FY 2007.

VI. THE FUTURE

VI.1. Needed Facilities

New Building. We are currently housed in 7 buildings spread across campus, and many of these are approaching 100 years in age. Our laboratory space is antiquated to the point of embarrassment and has been identified as the worst space on campus. It is amazing how productive our faculty manage to be despite our inadequate facilities. To remain competitive and to expand our research in the future, we must acquire modern laboratory space. The University has recognized our need and has identified the necessity for either replacement space or a totally new building for our department as a high priority on the campus building plan.

The building needs to have modern laboratories with fume hoods, cold storage and walk-in growth chambers. A high priority for the IPM and Biocontrol group is a **quarantine facility** in the new building that will allow us to import biological control agents from overseas for evaluation prior to release in the field. The Soils and Environment group needs an investment in modern instruments, for example, TOC analyzers for measuring dissolved carbon in aqueous phases, pore and surface area analyzer for determining nanopores size and distribution of nanoparticles, and HPLC-MS for detecting and measuring endocrine disruptors (e.g., 17α-ethinyl estradiol, bisphenol-A) in environmental samples. These instruments will be essential to successfully compete for extramural funding.

We are also badly in need of modern **greenhouse** space. Most PSIS greenhouses are so old that they pose a safety concern to users. Without lights, adequate temperature control, or insect screening, our

faculty have extremely limited options for plant research. New facilities are essential to support the research of recent hires (Adler, Parkash, DaCosta, Jung) and to recruit new faculty if we wish them to establish extramurally funded research programs. The University recognizes the need for adequate greenhouse and growth chamber space and is in the process of allocating 7.7 million to replace the present French Hall greenhouses

VI.2. Diversity

The Department is committed to attract qualified females and minorities. Of the entire faculty 22.9% is female, 14.3% are minority males, and 2.9% represents female minorities. During the last five hires we attracted 2 females, 2 minorities and 1 Caucasian male. All of these individuals are outstanding in their respective fields and contribute greatly to the recognition of our programs on a national level. In future hiring, the Department will attempt to maintain an emphasis on attracting outstanding female and minority candidates who will bring excellence in teaching, research, and outreach. (see Table 3 for summary)

VI.3. Anticipated Faculty Hiring

The ever changing world requires a continuous reassessment of our staff and faculty needs to accommodate the latest developments in teaching, research and outreach. Following is a listing of positions that are being proposed to be filled over the next 5 years. These positions are ranked in the following two categories: UMass 250 hires and filling vacancies as they become available on account of retirements and resignations. Over the next 10 years we anticipate about 12 retirements. The future success of our department depends to a large degree on acquiring new faculty who will build upon our current success and seize the emerging research opportunities of tomorrow. Below we list faculty positions which will help define that future. Several of these have already been requested as part of the NRE 250 hiring plan. In addition, we have identified other new positions that we feel will expand our future as a research powerhouse on this campus. The positions we envision are integrative in nature, and most fill existing gaps on campus. In our view the ideal new faculty hires will be people who work simultaneously on basic and applied questions. Our goal in the following section has been to describe the positions and why they are needed. We have listed the positions below in order of priority as we see it, but we recognize that these priorities will undoubtedly change following discussion with the entire department and outside reviewers.

VI.3.A. Highest Priority (proposed 250 Hires).

i. **Soil Ecosystem Modeling.**

The flow through soils and sediments of diverse particles and solutes, be they essential biological nutrients, environmental contaminants, nano- and colloidal particles, or water itself, is fundamental to understanding and managing soil ecosystems. The conceptualization, measurement and analysis of these dynamic processes requires the integration of theoretical, statistical and empirical research, as well as an appreciation of the diversity of implications of this research for solving applied and basic scientific problems. This position not only resolves a key deficiency in our Soil Sciences program, it significantly broadens the interface of our Soils program with several PSIS programs, including turf, agriculture, horticulture, sustainable agriculture and general ecology, that are concerned with the movement of nutrients through soils. The position also creates additional connections outside of PSIS, including GeoSciences, Engineering, and perhaps especially, the Environmental Sciences program. With this in mind, we have designed our description of this position to emphasize the analysis of these

processes in the broader context of ecosystem dynamics, to attract applicants that have broad viewpoints that emphasize these connections. We expect the successful candidate to establish a nationally recognized research program in the dynamics of flow through soils and sediments, develop an upper-division/graduate course in the modeling of soil ecosystem dynamics, and a junior-level core course in general ecosystem ecology.

ii. **Genomic Interaction at the Insect-Pathogen Interface.**
A tremendous influx of technology has brought organismal and molecular biology closer intellectually, and at that junction is the science of genomics. The relevance of this field to future scientific endeavor and the long-term prospects for funding in genomics makes this a high-priority area for development in PSIS. Accordingly, we are proposing a priority recruitment of an individual working in the genomics of insects and related pathogens. The scientist would study the interaction of insect vectors with the animal (including human) pathogens they transmit. Research initiatives in this area are likely to be high priority for years to come for each of the major federal funding agencies, including NIH and USDA. Furthermore, such a hire would strengthen existing programs in the study of animal pathogens (Rich), as well as insect pathology (Burand) and plant pathology (Wick, Jung). A qualified candidate in this area would strengthen PSIS ability to confront environmental challenges to animal health (e.g. Lyme disease, Eastern Equine Encephalitis virus, West Nile Virus) and plant health (e.g. turf diseases, invasive plant pathogens) in the Commonwealth. The position would add depth to our teaching in biotechnology. The incumbent will complement two other proposed faculty hires, one in plant metabolics/proteomics and another in functional genomics.

iii. **Plant Metabolics/Proteomics.**
Due to the recent advances in plant biotechnology and in this age of 'omics', there is a tremendous opportunity to utilize the genomics and proteomics tools to study the metabolic profiles of plants products. Plants possess an array of primary and secondary metabolites, which are not only the source of food and beverages but also provide numerous medicinal (phytopharmaceuticals) and industrial products. Phytopharamaceuticals is a growing field of plant biotechnology and has huge potential for larger federal and industrial funding. Secondary metabolites also mediate the interaction between plants, insects and disease and are a major component of plant resistance to attacks by these agents. The comprehensive analysis of the plant metabolites will be highly useful for developing strategies for insect and pest resistance in crops and for isolating novel plant pharamaceutical products. A new hire in plant metabolomics will certainly strengthen PSIS expertise and vision to be the leader in plant biotechnology research and teaching. At the same time, the position could provide innovative products for agricultural and other businesses in the state. This new faculty member will collaborate with other faculty (Adler, Parkash, Jung, Rich, Burand, Bernatzky) and other proposed new hires in plant functional genomics and insect/pathogen genomics.

VI.3.B. High Priority Hires (250 and replacement hires)

iv. **Molecular Insect Physiologist**.
Our department has a rich heritage in the field of insect physiology, but this legacy has diminished in recent years owing to faculty attrition. We seek to strengthen this area with an innovative scientist whose research focuses on physiological aspects of insect interactions with the environment and other organisms, including but not limited to flight, molting, endocrinology, reproduction, and

hematophagy/phytophagy. Understanding the basic physiological functions of insects is a lynchpin of our departmental program mission to synthesize basic science and applied research. Like all branches of science, insect physiology has undergone remarkable change in recent years and enjoys a renaissance due to the application of modern molecular and biochemical tools for understanding the functionality of genes and protein. The abundant and ever-increasing availability of genomic information from plants and animals now warrants attention to resolving how these molecules contribute to the function of the whole organism. A molecular insect physiologist studying regulation and control of novel genes and gene products will contribute to our basic understanding of insect biology and lead to informed strategies for insect management. Such a colleague would unite several areas of faculty interest throughout PSIS and greatly enhance our current research enterprise. The successful candidate will develop a nationally recognized, extramurally funded research program, interact effectively with diverse research and teaching interests in PSIS in physiology and molecular biology, and contribute to the teaching mission by developing a junior-level core course in general physiological ecology.

v. **Plant Functional Genomics.**
Due to availability of whole genome sequences of *Arabidopsis* and rice as well as fast advancing molecular technology, plant functional genomics is becoming a leading research area since the functions and structures of large sets of genes that influence biological processes of useful traits will be understood. Gene-knockout and gene-activation mutant lines can decipher the various physiological functions of plants. They can analyze expression profiles of all genes simultaneously and comprehensively, essentially giving scientists a map of plant products and the genes that control them. As a result, plant breeders can quickly and effectively improve useful traits and products in a plant species. This form of biotechnology is critical to future research in the plant sciences. To be competitive locally, nationally, and internationally in plant biotechnology, we have to continue to build a research team that utilizes genomic tools. A plant functional genomics faculty will collaborate with other faculty (Parkash, Jung, Rich, Burand) and with a new proposed hire on plant metabolics/proteomics in the department.

vi. **Ecosystem ecology**. Ecosystem ecology is the study of the movement of energy and matter through ecosystems, and examines areas such as nutrient cycling (especially carbon, nitrogen and phosphorous cycles), primary productivity, trophic dynamics, and global biogeochemistry. Global warming will become an ever more important social issue and will provide many funding opportunities in ecosystem ecology. An ecosystem ecologist would provide a bridge between our current research strengths in soils/environmental chemistry and in population ecology, and would interact with faculty spanning the range from plants to insects to microbes. Furthermore, an ecosystem ecologist would fill a teaching need for a core course proposed for the new Ecology major. Ecosystem ecology is an integrative field that typically brings in large NSF grants on the order of several million dollars. Possible areas of emphasis include nutrient cycling in terrestrial or aquatic systems, ecosystem response to global warming, and trophic dynamics. This position would interact with many faculty in our department, particularly those in Ecology/Evolution and Soils and the Environment

VI.3.C. Priority Hires (Replacement Hires)

vii. **Environmental Aquatic Chemistry**:

Water is an important, valuable natural resource; however, pollution (e.g., endocrine disruptors, persistent organic compounds, mercury) seriously degrades aquatic ecosystems and impairs the use of water for drinking, recreation, agriculture and other purposes. Knowledge and prediction of environmental fate and behavior of contaminants in aquatic systems are greatly needed. This individual may do research in the field of water chemistry and quality, and the exposure and risk to environmental and human health. Specific areas of interest may include processes affecting the behavior and fate of persistent organic compounds in water and sediments, bioaccumulation of xenobiotics in food chain, human exposure and effects, endocrine disruptors and toxic algae, and colloidal particles and water films. This individual will greatly strengthen the soil and environment program within the department and the inter-disciplinary environmental sciences program, and is expected to collaborate with existing programs especially those in soil and environment. The successful candidate is expected to develop an independent research program relating to qualitative and quantitative assessments of exposures to water-borne chemical, nanoparticles, or biological agents and assessing the associated health risks and/or effects. Candidates should have strong research records, spectroscopic (molecular) skills, and an interest in multidisciplinary research.

viii. **Insect Physiology, with Focus on Insect-Microbe Interactions.**
Many of the worst medical and agricultural problems caused by insects are inflicted not by the insects themselves, but by microbes that the insects transmit. Recent discoveries show that the extent of insects' dependence on microbes, and microbes' ability to influence insect biology, are much greater than we thought. Many insect-associated microbes have small, completely sequenced genomes and are readily transferable between hosts, making them excellent experimental organisms and possibly ideal agents for the manipulation or control of host populations. Three PSIS faculty, including two recent hires (Burand, Normark, Rich), already have insect-microbe interactions as a major aspect of their research programs. Synergism with strong Microbiology and Vet & Animal Science programs make NRE and UMASS good candidates as a center for excellence in this explosively growing, genomics-enabled research field. The faculty hired in this position would play a vital role in teaching the Insect Structure and function course for the Entomology Graduate program

ix. **Soil ecology**. There is a growing recognition that belowground interactions determine the outcome of many aboveground patterns of diversity and productivity. This individual may study how tropic interactions belowground structure below- and above-ground communities, and the effect of soil management and external chemical inputs including pesticides on soil microorganisms and soil fauna .Such interactions could be investigated between plant roots, insects, microbes, nematodes, pathogens and/or pesticides, in natural or managed ecosystems, and might involve a range of approaches and tools, including the study of soil decomposition, pesticide degradation, plant physiology and stress responses, insect or microbe host-finding behavior, and biochemical/genetic/molecular processes underlying all these areas. Such a person could potentially interact with current faculty studying plants, soils, insects, and pathogens, and research in this field could relate directly to Sustainable Agriculture, Soils and the Environment, and Ecology/Evolution.

x. **Invasive Plants.**
Invasive plants are second only to habitat loss as a cause of the reduction of diversity in native plant populations worldwide. As of today, more than 28% of the world's native plant species are threatened or endangered, including over 200 species in Massachusetts. Our department is strong in basic and applied research on the biology and control of invasive insects and pathogens, but we lack parallel

research on invasive plants. The control of invasive plants is a costly endeavor across agricultural habitats, forests, open fields, and waterways. Some possible areas of emphasis include biological control using insects or pathogens above or belowground, landscape-level research into spatial patterns of plant invasions, or interactions with soil microbes that have been recently found to mediate invasiveness of several plant species. This hire could potentially interact with several other current and proposed faculty, including those studying biological control, plant-insect interactions, plant metabolomics/proteomics, pathogens, and soil ecology.

xi. **Theoretical population ecology.**
Theoretical ecologists formulate, solve, and interpret models that describe how biological systems work. These models provide a general framework that makes predictions that can be tested with experimental studies. Conversely, the elucidation of models can bring a greater general impact to studies in a specific system; such collaborations between experimental and theoretical biologists are very attractive to NSF because they bring generality to empirical studies. A likely focus of this position could be the ecology and evolution of infectious diseases. This hire could help integrate the work of Burand, Rich, Cooley, Wick and Elkinton along with Riley in Biology and other faculty in Microbiology. The faculty hired in this position would play a key role in the new Ecology major. One advantage of a faculty hire in this area is that fairly minimal start-up costs would be required.

xii. **Landscape/Ornamental Plant Entomology.**
The urban nature of our state provides a compelling need for a person working on insect pests of ornamental plants that we have not addressed. The green industry, devoted to preserving and planting landscape ornamentals, is the largest component of the Massachusetts agricultural economy. Currently, we lack any faculty devoted exclusively to solving the many pest problems and environmental stresses faced by these plants. Opportunities would exist for this person to teach both undergraduate and Stockbridge courses on horticultural entomology or structural pest control. The positions would fit nicely with the research of Elkinton, Vittum, Van Driesche, Normark, and Adler. We envision that the person we hire would have both a basic and applied focus. In addition to tackling pest problems of ornamental plants, we would want someone who has an interest in basic science questions in ecology. The positions would contribute to the Urban Horticulture, IPM /Biological Control, and Ecology/Evolution research foci.

xiii. Invasive Pathogens of Plants.
Invasive plant diseases such as chestnut blight and Dutch elm disease have transformed the forest and shade tree landscape in North America, and new invasive pathogens such as sudden oak death are an emerging threat. The ever increasing volume of world trade virtually ensures that we will face new pathogens in the future. We used to have major expertise in shade tree pathology (Holmes and Tattar), who have retired. A specialist in this area would have ready access to funding and would play an important role in the areas of sustainable agriculture, urban horticulture, IPM and Molecular biology. Possible areas of emphasis could be interactions between plants, insect vectors, and pathogens, understanding of the interactions between plants, pathogenic agents and the environment, or work on how pathogens cause disease, using the latest genomic approaches to identify genes and processes involved in pathogenicity. Possible areas of emphasis for this position could be molecular methods for identifying and detecting microbial plant pathogens and applying these methods to management, the population ecology of plant microbes, the evolution and function of microbial plant pathogens on plant hosts, and/or applications of genetic probes for identification of plant pathogens *in situ*. The position

will complement other scientists studying pathogens of arthropods, vectoring of pathogens by arthropods, and the ecology of parasitic microbes. The research program will also support development of methods of microbe identification associated with plants in the context of integrated pest management and food safety.

xiii. **Tree Fruit IPM (endowed).**

The late Ron Prokopy's career of research on use of insect behavior to develop alternative approaches to control apple pests generated fame for himself and credit to the University within both the industry and internationally with his research colleagues. Efforts are underway to endow a position to continue work in apple IPM. This would allow the University to continue to be engaged with its land-grant mission and build on past success. It would re-enforce the entomology division's long standing strength in insect behavior and IPM and project this into the future. We expect support for this position from the Ron Prokopy Endowment. The position would be a major addition to our efforts in Sustainable Agriculture and IPM. Once we have raised sufficient funds to provide major support for this position, we will place it among the highest priorities for hiring.

VII. Conclusions

This AQAD review identified strengths and weaknesses within the Department. The strength of this department lies in its diversity of disciplines ranging from the molecular to the whole plant or insect. PSIS covers the disciplines traditionally associated with land-grant institutions but with greater selectivity in who we serve and in which manner. Modern molecular techniques greatly influence the way we can expand these traditional approaches and we plan on increasing our emphasis in molecular technologies. With the present faculty and anticipated future hires, we have tremendous potential to excel in teaching, research and service. To reach this potential the following six goals need to be considered.

- to work with the university administration to develop plans and initiate construction of a new state-of-the-art departmental teaching and research facility,
- to hire a new department head based on a national search,
- to prepare a new undergraduate curriculum proposal,
- to conduct integrative research that spans the range from basic to applied, from molecules to ecosystems, and from biotic to abiotic systems, including plants, insects, pathogens, and soil, air and water chemistry,
- to provide a range of basic and applied options in undergraduate and graduate education in that mirror our applied and basic research interests with foci in plant science and biotechnology, the environment and natural resources, turfgrass and horticultural science, sustainable food and farming, and ecology, and

- to build innovative outreach programming using biotechnology and related science to serve the needs of citizens of Massachusetts in support of a sustainable ecosystems, particularly around issues related to plants, insect pests, and soils.

The department currently is spread over 6 buildings, the oldest of which dates from the 1880's and the most modern one originates from 1963. None of these buildings have been updated on a regular basis and to a large extent are not suitable for modern teaching and research. Bringing the faculty together in one new building will bring synergies between the different disciplines thereby increasing the opportunity for generating funding opportunities.

The present department head has served the department since its inception in 2004 and has indicated his desire to step down. An initial survey indicated that there was no consensus among the faculty for an internal search. In stead the department voted to request initiation of a national search, which will broaden the base for candidates. Selection of the new head should be during the 2008 spring semester with a target starting date of September 2008.

The current undergraduate major in essence is the old Plant and Soil Sciences undergraduate major. Last year the Undergraduate Policy Committee developed a totally new curriculum. Unfortunately, this proposal was based in faulty information and it is our aim to develop, by the 2008 spring semester, a new undergraduate curriculum covering the breath of disciplines available in the department.

In a department with as diverse a set of academic interests as exists in Plant, Soil and Insect Sciences, finding common ground is critical. The central thread running through the varied programs in our department is ecology. We plan to foster this aspect of our research, teaching and outreach programs in order to generate the synergies that mark an excellent academic department. At the same time, we want to bring in new expertise in critical areas of modern biology in order to build our ability to obtain grants, teach and serve our constituents.

The Department teaches a large number of undergraduate and graduate students, but also has a large tenure system faculty, making our FTE/tenure system faculty 14, similar to the University as a whole. The majority of undergraduate majors and FTEs are in the applied Stockbridge School and in the four-year Turf concentration. We seek to bring a wider range of majors and students into our department courses, particularly in sustainable agriculture, ecology and plant biotechnology, while maintaining excellence in turf and horticultural science. To do this, we must hire new faculty compliment our existing expertise in different aspects of biotechnology, genetics and ecology.

The Department currently addresses some of the Commonwealth's most pressing concerns in environmental protection, human health and agricultural production while conducting internationally recognized basic research in ecology, evolution, molecular biology, and environmental chemistry. We believe that we can best continue to fulfill this mission with research that combines basic and applied studies, because each strengthens the other. In our view, the ideal new faculty hires will be people who work simultaneously on basic and applied questions. The positions we envision are integrative in nature, and most fill existing gaps on campus. The future success of our department depends in large degree on acquiring new faculty who will build upon our success and seize the emerging opportunities of tomorrow. We have identified six essential faculty positions that will largely define that future. We view the first three as our highest priorities, with the next three as being critical in the near future.

More than 10 faculty retirements are expected within the next 5 years. That is an opportunity to refocus our teaching and research programs by hiring faculty who work across disciplines. Some of these vacancies may be filled with individuals having similar backgrounds as the retiring faculty, whereas other vacancies may be filled with individuals representing disciplines identified below.

Highest Priority New Hires.

Soil Physics and Ecosystem Modeling. The flow through soils and sediments of diverse particles and solutes, be they essential biological nutrients, environmental contaminants, nano- and colloidal particles, or water itself, is fundamental to understanding and managing soil ecosystems. The conceptualization, measurement and analysis of these dynamic processes requires the integration of theoretical, statistical and empirical research, as well as an appreciation of the diversity of implications of this research for solving applied and basic scientific problems. This position not only resolves a key deficiency in our Soil Sciences program, it significantly broadens the interface of our Soils program with several PSIS programs, including turf, agriculture, horticulture, sustainable agriculture and general ecology, that are concerned with the movement of nutrients through soils. The position also creates additional connections outside of PSIS, including GeoSciences, Engineering, and perhaps especially, the Environmental Sciences program. With this in mind, we have designed our description of this position to emphasize the analysis of these processes in the broader context of ecosystem dynamics, to attract applicants that have broad viewpoints that emphasize these connections. We expect the successful candidate to establish a nationally recognized research program in the dynamics of flow through soils and sediments, develop an upper-division/graduate course in the modeling of soil ecosystem dynamics, and a junior-level core course in general ecosystem ecology.

Genomic Interaction at the Insect-Pathogen Interface. A tremendous influx of technology has brought organismal and molecular biology closer intellectually, and at that junction is the science of genomics. The relevance of this field to future scientific endeavor and the long-term prospects for funding in genomics makes this a high-priority area for development in PSIS. Accordingly, we are proposing a high priority recruitment of an individual working in the genomics of insects and related pathogens. The scientist would study the interaction of insect vectors with the animal (including human) pathogens they transmit. Research initiatives in this area are likely to be high priority for years to come for each of the major federal funding agencies, including NIH and USDA. Furthermore, such a hire would strengthen existing programs in the study of animal pathogens (Rich), as well as insect pathology (Burand) and plant pathology (Wick, Jung). A qualified candidate in this area would strengthen PSIS ability to confront environmental challenges to animal health (e.g. Lyme disease, Eastern Equine Encephalitis virus, West Nile Virus) and plant health (e.g. turf diseases, invasive plant pathogens) in the Commonwealth. The position would add depth to our teaching in biotechnology. The incumbent will complement two other proposed faculty hires, one in plant metabolics/proteomics and another in functional genomics.

Plant Metabolics/Proteomics. Due to the recent advances in plant biotechnology and in this age of 'omics', there is a tremendous opportunity to utilize the genomics and proteomics tools to study the metabolic profiles of plants products. Plants possess an array of primary and secondary metabolites, which are not only the source of food and beverages but also provide numerous medicinal (phytopharmaceuticals) and industrial products. Phytopharamaceuticals is a growing field of plant

biotechnology and has huge potential for larger federal and industrial funding. Secondary metabolites also mediate the interaction between plants, insects and disease and are a major component of plant resistance to attacks by these agents. The comprehensive analysis of the plant metabolites will be highly useful for developing strategies for insect and pest resistance in crops and for isolating novel plant pharamaceutical products. A new hire in plant metabolomics will certainly strengthen PSIS expertise and vision to be the leader in plant biotechnology research and teaching. At the same time, the position could provide innovative products for agricultural and other businesses in the state. This new faculty member will collaborate with other faculty (Adler, Parkash, Jung, Rich, Burand, Bernatzky) and other proposed new hires in plant functional genomics and insect/pathogen genomics.

High Priority New Hires

Molecular Insect Physiologist. Our department has a rich heritage in the field of insect physiology, but this legacy has diminished in recent years owing to faculty attrition. We seek to strengthen this area with an innovative scientist whose research focuses on physiological aspects of insect interactions with the environment and other organisms, including but not limited to flight, molting, endocrinology, reproduction, and hematophagy/phytophagy. Understanding the basic physiological functions of insects is a lynchpin of our departmental program mission to synthesize basic science and applied research. Like all branches of science, insect physiology has undergone remarkable change in recent years and enjoys a renaissance due to the application of modern molecular and biochemical tools for understanding the functionality of genes and protein. The abundant and ever-increasing availability of genomic information from plants and animals now warrants attention to resolving how these molecules contribute to the function of the whole organism. A molecular insect physiologist studying regulation and control of novel genes and gene products will contribute to our basic understanding of insect biology and lead to informed strategies for insect management. Such a colleague would unite several areas of faculty interest throughout PSIS and greatly enhance our current research enterprise. The successful candidate will develop a nationally recognized, extramurally funded research program, interact effectively with diverse research and teaching interests in PSIS in physiology and molecular biology, and contribute to the teaching mission by developing a junior-level core course in general physiological ecology.

Plant Functional Genomics. Due to availability of whole genome sequences of *Arabidopsis* and rice as well as fast advancing molecular technology, plant functional genomics is becoming a leading research area since the functions and structures of large sets of genes that influence biological processes of useful traits will be understood. Gene-knockout and gene-activation mutant lines can decipher the various physiological functions of plants. They can analyze expression profiles of all genes simultaneously and comprehensively, essentially giving scientists a map of plant products and the genes that control them. As a result, plant breeders can quickly and effectively improve useful traits and products in a plant species. This form of biotechnology is critical to future research in the plant sciences. To be competitive locally, nationally, and internationally in plant biotechnology, we have to continue to build a research team that utilizes genomic tools. A plant functional genomics faculty will collaborate with other faculty (Parkash, Jung, Rich, Burand) and with a new proposed hire on plant metabolics/proteomics in the department.

Ecosystem ecology. Ecosystem ecology is the study of the movement of energy and matter through ecosystems, and examines areas such as nutrient cycling (especially carbon, nitrogen and phosphorous cycles), primary productivity, trophic dynamics, and global biogeochemistry. Global warming will become an ever more important social issue and will provide many funding opportunities in ecosystem ecology. An ecosystem ecologist would provide a bridge between our current research strengths in soils/environmental chemistry and in population ecology, and would interact with faculty spanning the range from plants to insects to microbes. Furthermore, an ecosystem ecologist would fill a teaching need for a core course proposed for the new Ecology major. Ecosystem ecology is an integrative field that typically brings in large NSF grants on the order of several million dollars. Possible areas of emphasis include nutrient cycling in terrestrial or aquatic systems, ecosystem response to global warming, and trophic dynamics. This position would interact with many faculty in our department, particularly those in Ecology/Evolution and Soils and the Environment

List of Tables

Table 1.	Departmental faculty.	AQAD Review				04/07/07
Name	Rank	Specialty	Tenure	Date First	Date Last	Minority
Faculty			Track	Appoint.	Employ.	Status
Adler, Lynn	Assistant professor	Ecology of insect-plant interactions	yes	09/2004	active	female
Autio, Wesley	Professor	Pomology	yes	03/1985	active	no
Averill, Anne	Associate professor	Cranberry entomology/IPM	yes	05/1988	active	female
Barker, Allen	Professor	Plant nutrition	yes	07/1964	active	no
Bernatzky, Robert	Associate professor	Plant genetics and breeding	yes	01/1988	active	no
Bhowmik, Prasanta	Professor	Weed science	yes	09/1981	active	yes
Burand, John	Associate professor	Insect virology, bio-control	yes	09/1987	active	no
Cooley, Daniel	Associate professor	Plant pathology	yes	04/1978	active	no
Cox, Douglas	Associate professor	Floriculture	yes	09/1987	active	no
Craker, Lyle	Professor	Natural products, medicinal plants	yes	09/1969	active	no
DaCosta, Michelle	Assistant professor	Turf physiology	yes	08/2006	active	female
Ebdon, Scott	Associate professor	Turf agronomy	yes	07/1997	active	no
Elkinton, Joseph	Professor	Population dynamics of forest insects	yes	01/1980	active	no
Garrabrants, Nancy	Lecturer II	Floriculture	no	09/1980	active	female
Gerber, John	Professor	Plant science and sustainability	yes	09/1992	active	no
Greene, Duane	Professor	Pomology	yes	09/1969	active	no
Han, Susan	Associate professor	Production of floricultural crops	yes	01/1989	active	female
Herbert, Stephen	Professor	Agronomy	yes	02/1979	active	no
Jung, Geunhwa	Extension assistant professor	Turf pathology	no	08/2006	active	yes
Mangan, Francis	Extension associated professor	Vegetable production	no	05/1987	active	no
Manning, William	Professor	Air pollution biology	yes	06/1968	active	no
Normark, Benjamin	Associate professor	Insect systematics	yes	08/2000	active	no
Parkash, Om	Assistant professor	Plant molecular biology	yes	10/2004	active	yes
Picking, Deborah	Lecturer II	Wetland ecology; undergrad. Advisor	no	05/1998	active	female
Porter, Adam	Associate professor	Population genetics ecology	yes	09/1997	active	no
Rich, Stephen	Assistant professor	Insect molecular genetics	yes	07/2005	active	no
Simkins, Stephen	Associate professor	Soil microbiology and ecology	yes	09/1987	active	no
Stoffolano, John	Professor	Insect physiology	yes	09/1969	active	yes
VanDriesche, Roy	Extension professor	Biological insect control, IPM	no	10/1976	active	no
Veneman, Peter	Professor	Pedology	yes	09/1977	active	no
Vittum, Patricia	Professor	Turf entomology	yes	06/1980	active	female

Wick, Robert	Professor	Plant pathology	yes	04/1984	active	no
Xing, Baoshan	Professor	Environmental soil chemistry	yes	01/1996	active	yes
Table 1.B.	**Umass Extension and non-departmental staff**		**AQAD Review**			**04/07/07**
Name	**Rank**	**Specialty**	**Tenure**	**Date First**	**Date Last**	**Minority**
Carter, Anne	Extension assistant professor	Community vegetable production	non-active	01/1997	08/2006	female
Coli, William	Extension specialist	extension entomology	retired	na	na	no
Hazzard, Ruth	Extension specialist	vegetable extension	no	na	na	female
Hollingsworth, Craig	Extension specialist	aquaculture	no	na	na	no
Johnson, Norman	Non staff	entomology	no	09/2000	10/2003	no
Schloemann, Sonia	Extension specialist	fruit extension	no	na	na	female
Smith, Tina	Extension specialist	floriculture extension	no	na	na	female
Table 1.C.	**Former PSIS faculty and staff**		**AQAD Review**			
Name	**Rank**	**Specialty**	**Tenure**	**Date First**	**Date Last**	**Minority**
			Track	**Appoint.**	**Employ.**	**Status**
Beauchesne, Thom	departmental staff	Greenhouse manager	deceased	05/1971	08/2006	no
Boyle, Thomas	Professor	Breeding of floricultural crops	deceased	01/1986	12/2006	no
Ferro, David	Professor	entomology	retired	01/1978	12/2003	no
Prokopy, Ronald	Professor	Integrated pest management	deceased	09/1975	05/2004	no
Torello, William	Professor	Turf physiology	retired	09/1981	12/2003	no
Yin, Chih-Ming	Professor	entomology	retired	09/1978	12/2003	yes
AQADPersonnelSummary07						

Table 2. Summary of PSIS faculty arranged by gender and minority status. 08/07

Calendar Year	Total Faculty	Male Faculty	Female Faculty	Female Percent	Male Minority	% Male Minority	Female Minority	% Female Minority	Total % Minority
2001	32	26	6	18.8	4	12.5	1	3.1	15.6
2002	32	26	6	18.8	4	12.5	1	3.1	15.6
2003	32	26	6	18.8	4	12.5	1	3.1	15.6
2004	32	25	7	21.9	4	12.5	1	3.1	15.6
2005	33	26	7	21.2	4	12.1	1	3.0	15.2
2006	35	27	8	22.9	5	14.3	1	2.9	17.1

Table 3. **Student credit hours by semester and classes taught for the period fall 2003 to fall 2006 (7 semesters).** 07/07

Faculty Name	SCH Total by Faculty	SCH by Semester	Number of Semesters Active	Classes Taught in Active Semesters	Classes Taught per Semester	Remarks
Adler	54	14	5	2	0.4	na
Autio	903	129	7	17	2.6	
Averill	3307	472	7	10	1.4	
Barker	1531	219	7	14	2.0	
Bernatzky	610	87	7	9	1.3	
Bhowmik	777	111	7	8	1.1	
Boyle	704	101	7	7	1.0	
Burand	533	76	7	7	1.0	
Carter	182	30	6	5	0.8	ret
Cooley	1939	277	7	8	1.1	
Cox	1142	163	7	10	1.4	
Craker	1311	187	7	13	1.9	
DaCosta	na	na	1	na	na	na
Ebdon	1801	257	7	10	1.4	
Elkinton	559	80	7	5	0.7	
Garrabrants	180	26	7	8	1.1	
Gerber	3164	452	7	20	2.9	
Greene	339	48	7	7	1.0	
Griffin	758	108	7	7	1.0	
Han	2652	379	7	13	1.9	
Herbert	360	51	7	14	2.0	
Jung	na	na	1	na	na	na
Mangan	124	41	7	3	0.4	
Manning	1383	198	4	8	2.0	
Normark	1468	210	7	4	0.6	
Parkash	99	25	4	2	0.5	na
Picking	2264	323	7	7	1.0	
Porter	2705	386	7	3	0.4	
Prokopy	40	40	1	1	1.0	ret
Rich	654	131	5	2	0.4	na
Simkins	2858	408	7	15	2.1	
Stoffolano	1414	202	7	10	1.4	
Torello	150	150	1	1	1.0	ret
VanDriesche	182	26	7	4	0.6	
Veneman	370	53	7	9	1.3	
Vittum	855	122	7	8	1.1	
Wick	947	135	7	13	1.9	
Xing	232	33	7	7	1.0	
Total:	38551	5717		291	30.3	
Mean based on N=7	1015	150		7.6	0.9	

NA: new faculty member; ret: retired or deceased faculty member.

AQADCourseSectionsTaught07Sum2

Table 4. **Faculty publication record for the calendar years 2004 through 2006 based on the number of published papers in one of the journals listed in ISI's Web of Science.**

Faculty Member	Web of Science Publications '04	Web of Science Publications '05	Web of Science Publications '06	Mean 2004-2006
Adler, Lynn	6	1	3	3.33
Autio, Wesley	3	3	4	3.33
Averill, Anne	1	2	6	3
Barker, Allen	4	0	3	2.33
Bernatzky, Robert	0	0	1	0.33
Bhowmik, Prasanta	2	0	5	2.33
Boyle, Thomas	0	2	0	0.67
Burand, John	1	1	1	1.0
Carter, Anne	2	0	0	0.67
Cooley, Daniel	1	0	0	0.33
Cox, Douglas	0	0	0	0
Craker, Lyle	0	1	1	0.67
DaCosta, Michelle	na	na	na	na
Ebdon, J. Scott	1	2	0	1.0
Elkinton, Joseph	4	3	1	2.67
Gerber, John	0	0	0	0
Greene, Duane	2	5	1	2.67
Han, Susan	0	0	2	0.67
Herbert, Stephen	4	7	7	6.0
Jung, Geunhwa	na	na	3	3.0
Mangan, Francis	0	1	1	0.67
Manning, William	2	4	3	3.0
Normark, Benjamin	3	1	4	2.67
Parkash, Om	1	5	2	2.67
Picking, Deborah	1	0	0	0.33
Porter, Adam	1	2	0	1.0
Rich, Stephen	na	0	0	0
Simkins, Stephen	0	0	0	0
Stoffolano, John	1	1	3	1.67
Van Driesche, Roy	4	2	5	3.67
Veneman, Peter	1	1	2	1.33
Vittum, Patricia	0	0	1	0.33
Wick, Robert	0	0	0	0
Xing, Baoshan	8	17	24	16.3
Total Publications:	53	61	83	197
Active Faculty:	31	32	33	96
Publications/FTE	1.71	1.91	2.52	2.1

Faculty:

na: Recently hired faculty member, no Umass publication record for that specific reporting period.

Table 5 **Summary of total, direct and indirect revenues from sponsored research by fiscal year for the period 2001 through 2007.**

Fiscal Year	Direct Costs Total	Direct Costs Mean/Faculty	Indirect Costs Total	Indirect Costs Mean/Faculty	Sponsored Grant Total	Sponsored Grant Mean/Faculty	Number of Grants	Number Faculty	Grants/ Faculty
FY 2001	$2,078,317	$64,947	$188,381	$5,887	$2,266,698	70,834	80	32	2.5
FY 2002	$1,781,259	$55,664	$253,600	$7,925	$2,034,859	63,589	95	32	3
FY 2003	$2,042,123	$63,816	$374,607	$11,706	$2,416,730	75,523	76	32	2.4
FY 2004	$2,233,605	$69,800	$129,908	$4,060	$2,363,513	73,860	82	32	2.6
FY 2005	$2,633,734	$79,810	$209,038	$6,335	$2,842,773	86,145	79	33	2.3
FY 2006	$2,313,702	$66,106	$333,868	$9,539	$2,647,570	75,645	77	35	2.2
FY 2007	$3,029,099	$94,659	$337,161	$10,537	$3,366,260	105,196	88	32	2.8
Total:	$16,111,839		$1,826,563		$17,938,403		577		
Annual Mean:	$2,256,881		$260,938		$2,517,818		82		2.5

AQADSponsoredSummary

Table 6. **Revenues generated by sponsored research by principal investigator and fiscal year for the period 2001 through 2007.** **8/31/2007**

PI Name/Faculty	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	Total	Status
Adler, Lynn	na	na	na	na	159532	25209	0	184741	fac
Autio, Wesley	0	0	0	0	0	0	28225	28225	fac
Averill, Anne	5000	7000	37377	412637	58724	16125	104100	640963	fac
Barker, Allen	0	17064	0	0	230038	0	0	247102	fac
Beauchesne, Thom	0	850	0	0	0	na	na	850	non-fac
Bernatzky, Robert	0	6000	0	0	0	0	0	6000	fac
Bhowmik, Prasanta	42450	42200	53025	38000	47750	32250	11800	267475	fac
Boyle, Thomas	30000	31000	40000	30000	50000	60000	67000	308000	fac
Burand, John	0	211011	0	0	0	40000	34000	285011	fac
Carter, Anne	0	0	32548	0	7295	na	na	39843	fac
Coli, William	389500	189438	11521	125000	64949	0	25000	805408	retired
Cooley, Daniel	215200	75165	160000	170000	0	40782	426805	1087952	fac
Cox, Douglas	0	0	5150	5000	0	3012	5000	18162	fac
Craker, Lyle	35575	500	4550	500	0	500	54653	96278	fac
DaCosta, Michelle	na	na	na	na	na	na	3000	3000	fac
Ebdon, Scott	0	39920	32968	82300	26430	36000	2100	219718	fac
Elkinton, Joseph	295744	480125	132821	362260	333417	477654	399820	2481841	fac
Ferro, David	71946	na	na	na	na	na	na	71946	retired
Gerber, John	0	0	0	0	0	0	0	0	fac
Greene, Duane	15000	4000	7950	10500	10000	10800	66288	124538	fac
Han, Susan	7500	5024	0	0	0	0		12524	fac
Hazzard, Ruth	9285	87340	28862	247665	98086	46962	3000	521200	non-fac
Herbert, Stephen	11200	114669	184240	54250	55000	201313	522000	1142672	fac
Hollingsworth, Craig	127900	195579	0	75000	135126	149110	193696	876411	non-fac
Johnson, Norman	116999	0	0	0	0	0		116999	non-fac
Jung, Geunhwa	na	na	na	na	na	na	88700	88700	fac
Mangan, Francis	304637	28284	29725	74100	0	52530	145262	634538	fac
Manning, William	0	0	0	0	0	0	0	0	fac
Normark, Benjamin	0	0	226086	0	172061	165574	141023	704744	fac
Parkash, Om	0	0	0	0	0	24300	40000	64300	fac

Picking, Deborah	0	0	0	0	0	0	0	0	fac

Continued on Next Page

Table 6. (cont.) **Revenues generated by sponsored research by principal investigator and fiscal year for the period 2001 through 2007.**

PI Name/Faculty	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06	FY 07	Total	Status
Porter, Adam	130000	60000	712000	0	0	0	0	902000	fac
Prokopy, Ronald	17580	18860	27831	16920	1639	0	0	82830	deceased
Rich, Stephen	0	0	0	0	0	532664	298911	831575	fac
Schloemann, Sonia	0	0	0	0	9218	10410		19628	non-fac
Simkins, Stephen	0	0	0	0	0	0	0	0	fac
Smith, Tina	1000	1200	0	0	83637	0		85837	non-fac
Stoffolano, John	0	0	0	0	0	0	0	0	fac
Theis, Nina	na	na	na	na	na	89903	104085	193988	non-fac
Torello, William	12000	0	na	na	na	na	na	12000	retired
VanDriesche, Roy	105232	51750	143500	287749	314200	152000	191553	1245984	fac
Veneman, Peter	259996	268680	354970	131065	429239	274357	158452	1876759	fac
Vittum, Patricia	43300	79200	55005	120917	97213	91365	169143	656143	fac
Wick, Robert	0	8000	0	71650	15218	61750	82644	239262	fac
Yin, Chih-Ming	19654	12000	2163	na	na	na	na	33817	retired
Xing, Baoshan	0	0	134438	48000	444000	53000	0	679438	fac
Total:	2266698	2034859	2416730	2363513	2842772	2647570	3366260	17938402	

AQADGrantSummary07

List of Appendices

Merger of the Department of Plant and Soil Sciences
and the
Department of Entomology

September 26, 2003

The merger of the Department of Entomology and the Department of Plant and Soil Sciences will strengthen the teaching and research mission of each unit. The faculties of both departments have endorsed the concept of this merger.

The new department will consist of two divisions: a Division of Entomology and a Division of Plant and Soil Sciences. Each faculty member within the department will select one division with which to be associated.

A division coordinator, elected from within the divisional membership, will represent each division. The two division coordinators, along with the department head, will form the executive committee.

The department head will represent the department to the dean of the college and to other constituencies and will serve on the college leadership council. The department head, in consultation with the other members of the executive committee, will be responsible for developing departmental plans, making teaching assignments, space assignments, distributing departmental allocations of federal, state and other funds, assigning staff, and recommending personnel actions in the department. The dean will consult with the executive committee on all major department actions over which there is a lack of consensus.

The divisional structure of the department, as outlined above, can only be changed by a majority vote of each of the divisions.

The department personnel committee will consist of five members, at least two of whom will be from each division. This configuration may be changed by majority vote of the faculty of each division. Members of this committee will be elected annually by secret balloting. Full-time faculty in ranks of instructor and above will be voting members of the faculty and eligible to serve on the personnel committee. Current voting faculty with the rank of lecturer will continue with eligibility to vote and serve on the personnel committee. Adjunct faculty will not be eligible to vote in the election of, or to serve on the personnel committee.

The department will serve as the home for two graduate programs, one in Entomology and one in Plant and Soil Sciences. A single undergraduate curriculum will continue as a major in Plant and Soil Sciences, serving both divisions, and concentrations will be developed within this curriculum to reflect the disciplines within the department. The department will also continue to teach in and to support the curriculum and majors of the Stockbridge School of Agriculture.

Benefits from the proposed merger:

Both of the merging units currently strive to use the latest methods and technologies to answer basic scientific questions while applying these same approaches to solving practical problems. Joining in a

common department will enhance the exchange of ideas of common interest and will stimulate new areas of research collaboration. With the restructuring and appropriate investments will come a significant increase in extramural funding for research.

We anticipate an increase in student numbers at both the undergraduate and graduate levels as students are presented with integrated programs within the disciplines defined by the department. A department that emphasizes a fundamental understanding of plants, insect, soil, and environmental processes is in a position to prepare students to be on the cutting edge of basic research and at the same time to take advantage of the rapidly changing opportunities in agriculture and the green industry.

Together, the new department will occupy space in ten buildings. These are some of the oldest buildings on campus and lack the infrastructure necessary to conduct modern laboratory science. The merge will not immediately relieve the space limitations but it will allow for more integrated and creative solutions. The merger pf the two departments will initiate efforts to consolidate the new department into suitable space through both renovation and new construction.