

# DEPARTMENT OF FOOD SCIENCE

## Strategic Plan 2014-15 through 2018-19



*College of Agricultural Sciences*

*February, 2014*



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# STRATEGIC PLAN 2014-2019

## DEPARTMENT OF FOOD SCIENCE

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### VISION STATEMENT

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The Department of Food Science will be the leader in the integration of teaching, research and service, and recognized internationally for its preeminent undergraduate program and innovative research in the context of graduate education.

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### MISSION STATEMENT

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The Department of Food Science provides science, education, and outreach contributing to an abundant supply of affordable, safe, nutritious, and appealing food.

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### THE NATURE OF THE DEPARTMENT

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Penn State has a large and comprehensive department of food science with strengths in the research, education and outreach missions as well as in the core disciplinary areas of chemistry, engineering, microbiology and nutrition. Administratively, the department is located in the College of Agricultural Sciences where among the programs in the college, it represents the part of the food system closest to and most influenced by the consumer. (Appendix 1 contains further discussion of the nature of food science as well as the relationship between the Department of Food Science and the food system).

The number of undergraduate students enrolled in the food science major grew 250% (from 84 to 210) during our last planning cycle, and the number of graduates increased from 20-68 indicating the program remains robust (Figure 1, Appendix 2). Penn State has one of the largest food science programs in the US (ranked number 2 in a 2012 survey conducted by the Institute of Food Technologists). Our up-to-date laboratories, pilot plants, classrooms and our unique access to a real manufacturing facility—the Berkey Creamery—have all strengthened our teaching programs. Our students further enrich their coursework with internships, international experiences, research, and through leadership opportunities in our active Food Science Club. Graduates continue to enjoy excellent employment prospects and report high levels of satisfaction with the program. We maintain strong connections with our alumni and food industry professionals through the Food Industry Group (FIG), alumni social events and online social networking.

We effectively integrate our graduate teaching and research missions in graduate education. We have consolidated the course requirements at the graduate level and increased the breadth of optional courses available. Graduate enrollments and degrees granted remained steady throughout the last planning cycle, with a small but steady increase in the proportion of Ph.D. candidates (Figure 2, Appendix 2). Total funding and funding per faculty throughout the last planning cycle is presented in Figure 3, Appendix 2.

The Department of Food Science has provided outreach and/or training programs (e. g. Food Microbiology Short Course, Ice Cream Short Course, Ice Cream 101, Pasteurizer Operators Workshop, Cultured Dairy Products Short Course, HACCP, and Sanitation Short Course) to the food industry since its foundation. The Food Science Pilot Plants have allowed us to enhance our outreach activities. During the last planning cycle we initiated and grew on-line/distance education options for our outreach programs, e.g. on-line sanitation program, and online programs in food defense.

The Berkey Creamery, housed in our department, is the largest and most successful facility of its type in the United States, and our teaching, research and Extension/outreach programs benefit from its presence. Our undergraduate students use the production-scale facility in their classes and for the work experiences a creamery internship can provide. Our graduate students use the creamery facilities to conduct practical research in a real manufacturing setting. An example of research activity made possible because of the Creamery is ongoing collaborations between Georgetown University and Penn State to assess the efficacy of probiotic bacteria delivered via a yogurt-based drink produced in the Creamery. Access to the facility and practical manufacturing expertise also strengthens our Extension and outreach programs. The salesroom raises our profile on campus and provides a showcase for our programs.

Quantitative measures of the size and scope of the department and changes over time are provided in Appendix 2.

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## **DIRECTIONS FOR CHANGE**

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The future strength of our department lies in the importance of the questions we address. At a global scale, the twin problems of hunger and obesity, the relationship between diet and wellness, and the consequences of our choice to process food crops for energy uses all demand an understanding of the science of foods. More locally, the food processing industry is an important part of the state and national economy and historically a part that has been relatively resistant to recession. The success of the food industry depends on the skills of our graduates as well as the outreach education and research solutions developed and extended by the department.

Our department has a long history of using strategic planning to guide our development (summarized in Appendix 3). We have made significant progress in achieving those goals and objectives set out in our previous plan (2008-2013). Among the Directions for Change articulated in our 2008-13 Plan was *Improve Consumer Health and Wellness*, which motivated hiring decisions (e.g. Vanamala) and remains a theme integral to the mission of our Department. A second initiative, *Enhance the Food Science Undergraduate Program*, has resulted in a large and rapid increase in undergraduate enrollment. The challenge presented by our success was met by, among other means, the hiring of a full-time instructor (Milillo) and a teaching laboratory support specialist (Klaiber).

The atmosphere of the Department, both intellectual and social, is vibrant. Throughout the last planning cycle the Graduate Seminar series has been strengthened, attendance is excellent, with an ever increasing audience from outside the Department. An active Social Committee continues to provide opportunities for faculty, staff and students to interact, helping to maintain a sense of community in the Department.

During the period of the 2008-13 plan, Dr. John Floros left to become Dean, College of Agriculture, Kansas State University and, therefore, it was necessary to hire a new Head of Food Science. Dr. Robert Roberts interviewed and was selected Head of Food Science, leaving a gap in our teaching and research program that we hope to fill early in this planning cycle.

The following initiatives and cross-cutting themes have been identified as emphases in the current plan.

### **FOOD SAFETY, SECURITY AND SUSTAINABILITY**

Microbial food safety is foundational to food technology and a historical strength of the Food Science Department. While maintaining our focus in this area, we will seek to expand our conception of food safety to include threats, whether incidental or intentional, posed by food-borne viruses and parasites. Additionally, we will broaden the definition to include chemical food safety, e.g. toxicology, allergens, and immunology, areas that provide opportunities to collaborate with colleagues across the College and University.



World population is predicted to be 9-10 billion by 2050, with the U.S. population increasing by 40%. It is anticipated that this growing population will be more urban with higher per capita incomes and demand even safer, higher-quality food. Ensuring food security, i.e., *“when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”*, will require the development of new technologies and the application of existing technologies, especially in the face of a changing climate.

Long-term food security will require sustainable food systems. Most large food manufacturers now have corporate sustainability initiatives and are requiring knowledge of sustainable practices of our graduates. Penn State defines sustainability as “the pursuit of human health and happiness, environmental quality, and economic well-being for current and future generations.” Though conceptually somewhat nebulous, the opportunity exists to help define and pursue sustainability for the food industry and higher education in the context of Penn State’s Strategic Framework for Sustainability.

## **INTERNATIONALIZATION**

Despite the recent emphasis on local food systems, consumers are still dependent on highly globalized food supply chains. Employers expect our students to have at least some awareness of the global nature of markets and international experience improves a student’s employment opportunities. Furthermore, faculty compete globally for the best students and for funding e.g. from aid agencies, NGOs and multinational businesses.

As Pennsylvania’s land grant university, Penn State and, therefore, Penn State Food Science has a unique obligation to Pennsylvania citizens that may, in part, be satisfied by helping connect them to the global community. For example, the chocolate and confectionery industry is dependent on a reliable source of cocoa and sugar, neither of which grow in Pennsylvania. The QS World University Rankings by Subject for 2013 placed Penn State’s College of Agricultural Sciences 9<sup>th</sup> among international schools of agriculture and forestry. The eight universities ranked above Penn State are either international universities or U.S. universities with a strong international presence. To improve Penn State’s ranking we must extend our reach globally (see *Goal B. Empower the engines of discovery and application* of the CoAS strategic plan).

## **FOOD CHOICE**

This is an extension of our previous initiative *Improve Consumer Health and Wellness*. Dietary choice is fundamental to both health outcomes for consumers and the economic well-being of those in the food industry. Debate on the proper diet and the role of food processing pervades the news and the interest among potential students and the public in food science is high. This approach calls for rational, fact-based analysis of the issues, and a thorough understanding of the drivers of dietary choice.

Food choice is influenced at the individual, family, and community level, and can be studied using qualitative and quantitative approaches across disciplinary boundaries. Individuals make decisions about food everyday based on past experience, perceptual differences, habitual intake and responses to environmental cues. Even young children make food choices in grocery stores, day care units, schools and at social events. Understanding ‘nutrition from the neck up’ is critical to improve health and wellness, as biological consequences of functional food ingredients are irrelevant if the product is not consumed, and better understanding of biological driven market segmentation has the potential to revolutionize how food companies formulate tailored products for targeted market segments, and to personalize nutrition interventions for increased patient compliance.

At the university level, Penn State has long held an international reputation for excellence in ingestive behavior research. This legacy is in flux with faculty departures and pending retirements in other units outside the College, but recent hires within Food Science will ensure this excellence is maintained. Potential areas of growth and synergies with other units in the College include application of social science methods to explore consumer perception of processed foods, biotechnology and nanotechnology, and genetically modified foods. We also intend to work with other departments to develop and explore ethical issues related to food and food choice.

## **BUILDING COLLABORATIONS**

It's nearly cliché these days to say that the complexity of the scientific enterprise demands a multidisciplinary, collaborative approach to research, and that truly transformative findings will come at the intersection of academic domains. By its nature, food science is interdisciplinary, incorporating chemistry, biology, and engineering within a single academic department, and it is all too easy to establish productive collaborations within the walls of the Food Science Building, which we routinely do. However, even greater gains are to be had through collaborations beyond our departmental boundaries. We will continue to expand our collaborations initiated during the last planning cycle and develop new collaborations within the College, across the University and with colleagues at other universities, national laboratories or research institutions including corporate R&D centers.

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## **STRATEGIC INITIATIVES 2014-15 THROUGH 2018-19**

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### **RESEARCH**

Strategic initiatives in research are usually considered part of a subset of graduate education, but here we consciously separate our initiatives for research productivity from those for educational outcomes (see *Graduate Education*).

#### **Goal 1: Secure resources to support quality research**

- a) Fill two open faculty positions, and work to secure funding for remaining priority hires. Position descriptions are provided in Appendix 5.
- b) Solicit funds from both traditional and non-traditional sources, including:
  - i. Competitive grants – increase submissions to a broader range of programs and agencies;
  - ii. Industry – actively seek collaborations with industry including building strategic alliances; and
  - iii. Foundations & NGO's – research on health and wellness, as well as, environmentally sustainable food systems should position the department for funding from non-governmental organizations.
- c) Build endowments for support of research by seeking faculty chairs and graduate fellowships through targeted development efforts.
- d) Restructure the Center for Food Manufacturing with increased company membership and faculty participation, with the goal of supporting graduate students.

- e) Explore development of a proposal to establish a gnotobiotic pig facility at Penn State and seek external funds for its development and sustainable operation.

**Goal 2: Facilitate collaboration both internally and externally**

- a) Build strategic relationships with international peer universities to foster faculty and student exchange, and build research collaborations;
- b) Appoint more adjunct faculty and courtesy appointments and encourage our own faculty to seek courtesy appointments in other departments and at other universities;
- c) Pursue collaborative research initiatives with the Department of Nutritional Sciences and Hershey Medical Center;
- d) Lead/participate in college efforts on the food/fuel/fiber system especially in toxicology, immunology, and bio-based materials; and
- e) Increase interaction with the Huck Institutes of the Life Sciences, especially as it relates to infectious disease.

**OUTREACH**

The Department of Food Science has provided highly-valued, outreach training (e.g. Food Microbiology Short Course, Ice Cream Short Course, Ice Cream 101, Pasteurizer Operators Workshop, Cultured Dairy Products Short Course, HACCP, and Sanitation Short Course) to the food industry since its inception. In 2006, the Department of Food Science moved into a new facility that houses state-of-the-art creamery production, research and teaching facilities, as well as two food manufacturing pilot plants and one food safety pilot plant. These facilities provide long-term support to a number of research and many different outreach activities (shortcourses, workshops, etc.).



In July 2013, the Department launched the Food Science Certificate program. This program provides food industry professionals with educational opportunities in food science, safety, and processing technology, while also preparing them for career advancement opportunities. With travel costs escalating, the food industry is turning to alternative training opportunities for their employees, including on-site and distance education programs. Given the history and success of our well-recognized outreach programs and the potential for increasing our impact through

the new Food Science Certificate program, the Department of Food Science is poised to become the go-to source for educational opportunities for food industry professionals in Pennsylvania and beyond.

We aspire to be the recognized leader in the development and delivery of outreach programs (short courses, workshops, distance education, etc.) that meets the educational needs of the food industry, thereby increasing their competitiveness and profitability, while enhancing the well-being of the consuming public. The following goals and action plans advance that mission.

**Goal 1: Assess the department's role in the Pennsylvania food system**

- a) Conduct targeted needs assessments of stakeholders (e.g. dairy, produce, meat, poultry, snack food, and confectionary industries; farmers' markets vendors, regulatory agencies, etc.) and use the information to develop new and/or improve existing outreach programs by the end of 2014;
- b) Conduct a gap analysis to assess collaborations and/or interactions of faculty, staff, and students in the Department of Food Science with various sectors of the food industry throughout Pennsylvania by the end of 2015; and
- c) Work with faculty and staff to organize yearly plant and/or industry tours as a way to connect with food industry professionals and promote our portfolio of outreach activities, thereby improving the visibility of the Department across the Commonwealth by the end of 2014 (and continuing thereafter).

**Goal 2: Address the research and educational needs of the food industry, food entrepreneurs, and the consuming public**

- a) Seek funding opportunities with the goal of developing at least two online and/or hybrid short courses and workshops for food industry professionals for inclusion in the Food Science Certificate program by 2019;
- b) Identify and offer at least two external (non-PSU) course curricula that can be used to provide educational resources to food industry personnel when they are not available in-house (ex. Feed HACCP) and if possible, incorporate them into the Food Science Certificate program by 2018;
- c) Based on the results from the needs assessments and gap analysis described in Goal 1, offer at least two new short courses and/or workshops by the end of 2019;
- d) Determine the demand and feasibility for new food science outreach and/or Extension programs for adult learners outside of the food industry (e.g. weekend hobby series) or middle and high school students (e.g. Science –U summer camps) by the end of 2017.
- e) Serve the nutrition education needs of the general public by supporting the College's effort to hire an Extension nutrition/health faculty member.

**Goal 3: Identify new and strengthen existing outreach partnerships at the departmental, university, state, national, and international levels**

- a) Develop an advisory board for the OPC, to advise and prioritize activities during the next five years by the end of 2015;

- b) Offer two established short courses and/or workshops in states other than Pennsylvania and/or outside of the U.S. to reach a broader food industry audience and to promote our portfolio of outreach activities by the end of 2016; and
- c) Examine opportunities for regional collaborations (e.g. Mid-Atlantic, Northeast) for developing one or more new outreach program areas by the end of 2018.

**Goal 4: Provide leadership and support to Cooperative Extension issues**

- a) Identify and facilitate College and Food Science Extension initiatives (e.g. Food Safety Extension Program Priority Initiative, Food Safety and Quality State Extension Team, the PSU-PDA Food Safety Resource Center) that are aligned with the strategic objectives of the College of Agricultural Sciences and the Department of Food Science by the end of 2015; and
- b) Increase Food Safety and Quality (FS&Q) State Extension Team (SET) input in Extension related-resource allocations and hiring decisions by the end of 2019.

**UNDERGRADUATE EDUCATION**

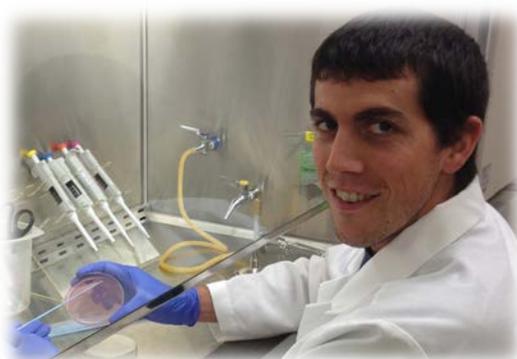
**Goal 1: Improve the quality of undergraduate education in food science**

- a) Assess the food science curriculum based on the educational objectives developed as a faculty during the previous planning cycle. Based on the assessment, which we will complete before 2015, revise the curriculum specifically to address the following points and others that may come up as appropriate.
  - i. Rearrange course schedules to address room conflicts and the course sequence.
  - ii. Explore the feasibility of developing a 2-semester product development course for senior food science majors. This course would focus on project-based learning and would be similar to the College of Engineering's Learning Factory model with respect to educational objectives and external sponsorship themes. This course may also support the Department's broader goals as they relate to outreach; however, additional investments in teaching personnel would be required.
  - iii. Explore ways to integrate some elements of food analysis (e.g., proximate analysis of major food components) into the sophomore year, perhaps within the context of FD SC 201 (Introductory Food Science Practicum). The educational objectives and scope of FD SC 410 (Chemical Methods of Food Analysis) will likely change as a consequence, and would focus solely on advanced and instrumental food analysis.
- b) Improve the quality of academic advising by ensuring that all faculty member advisors are aware of the current resources and protocols. In light of recent enrollment increases, we will explore strategies for gaining efficiencies in the way we approach advising while simultaneously improving quality. One possible strategy would be to designate one (or a few) staff and/or faculty members to handle basic advising responsibilities (e.g., advise on questions relating to course sequence, logistical matters, and foundational or supporting courses outside the food science program); the remainder of the teaching faculty will continue to advise undergraduate students on matters related to food science careers and post-graduate opportunities.

- c) Continue to maintain and upgrade equipment and facilities in the food microbiology teaching laboratory. Significant investment has been made to improving the food chemistry teaching laboratory over the past 5 years; however, the food microbiology is in need of major equipment upgrades. We aim to complete the first phase of these upgrades before 2015.
- d) Work with World Campus to conduct a market survey for online offerings of FD SC 105 (Food Facts and Fads) and FD SC 200 (Introduction to Food Science). If online versions of these courses are deemed feasible, and assuming an investment in teaching faculty is made, we will work to develop one or both of these resident education courses into online courses. We will also work to make FD SC 200 a general education course (GS). Our goal is to complete this goal by 2015.
- e) Collaborate with the Dickinson School of Law, Agricultural Law Center, and other universities (e.g. Michigan State University Institute of Food Law), to enhance our students' understanding of food laws and regulations.

### **Goal 2: Enhance recruitment and retention while improving student quality**

- a) Given the present number of teaching FTEs and support staff in the Department, it is difficult to envisage a path towards a higher undergraduate enrollment without compromising the objectives of Goal 1 (quality of undergraduate education). In the absence of significant investments in teaching personnel over the next 5 years, our goal is to manage our existing enrollment target of 150 students (although numbers have exceeded this target over the past 3 years).
- b) In the event that significant investments in teaching personnel are made, our goal will be to increase enrollment to 300 undergraduate students. New teaching faculty hires will be required for us to reach this goal, as well as professional staff to manage the pilot plant and to provide program management support.
- c) Regardless of enrollment, in order to improve student quality in the major, we will explore increasing the number of C-required courses and requiring more rigorous foundational courses. A first step in this process will be to conduct a retrospective study that determines if success in some key foundational courses is predictive of overall academic achievement in the food science major.



### **Goal 3: Explore the creation of a new major in sensory science or related field**

We will establish the feasibility of creating a sensory science major. There is anecdotal evidence to suggest that there is significant industry demand for B.S.-level graduates with experience in sensory science; therefore, our first step will be to quantify the magnitude of that demand. By year 2014, we will have consulted with the Institute of Food Technologists' Sensory Division, as well as key personnel representing the field of sensory science in industry. If we determine that there is sufficient demand for sensory science

graduates, we will develop a framework for the major by 2015, and initiate a dialogue with the College by 2016.

## **GRADUATE EDUCATION**

### **Goal 1: Assess and enhance the quality of the graduate program**

- a) Update the Graduate School assessment of the Food Science program by 2015.
- b) Review graduate course offerings and assess outcomes of two specific courses/year.
- c) Develop a proposal for a “food science bootcamp” and bring it to Faculty for approval by 2015.
- d) Develop a proposal for participation in the INTAD double major and bring to Faculty for approval by 2015.
- e) Identify at least one selective international institution/year with whom to develop cooperative relationships for student and faculty exchange and research collaborations.

### **Goal 2: Determine size of graduate student population needed to maintain a vibrant program, and develop strategies to maintain these numbers using external funding**

- a) Benchmark student numbers against competitive programs by 2016.
- b) Identify the targeted number and diversity of graduate students by 2016.
- c) Develop a recruiting strategy by 2017 (see Diversity Planning).
- d) Expand on-line offerings and explore non-thesis options by 2019.
- e) Work with development on a strategy for approaching donors (especially companies and associations) to fund endowments for graduate fellowships (ongoing).
- f) Recruit students with externally-funded scholarships (ongoing).
- g) Develop and deliver a seminar for graduate students on strategies for obtaining “self” funding by 2017.
- h) Submit at least one collaborative “training grant” each year.

## **ACADEMIC SUPPORT UNITS**

The Food Science building houses three unique food manufacturing pilot plants, a sensory evaluation center and a licensed creamery that are recognized strengths of the food science department. These facilities contribute to the teaching, research and outreach mission of the department.

### **Berkey Creamery Goal: Use the processing facility to enhance the teaching, research, and outreach endeavors of the department**

- a) Maintain the “state of the art” status of the Berkey Creamery -- leading with technology, regulations, and industry best practices.
- b) Enhance the Creamery's role in all three land-grant missions as a living laboratory for the next generation of food science leaders.
- c) Obtain SQF certification for our processing facility by 2018.

**Pilot Plants Goal: Enable the Food Science Pilot Plants to be state-of-the-art facilities supporting education, research, and outreach**



- a) Develop a position description and funding model (by 2015) and hire a “Pilot Plant Specialist” (by 2016) to oversee pilot plant operations and assist in teaching and research.
- b) Explore seeking approval of the Wet/Dry pilot plant as a certified food manufacturing facilities (by 2019).
- c) Optimize scheduled use of the the pilot plant to avoid conflicts and minimize downtime (2014).
- d) Develop a plan for equipment maintenance including a funding model (by 2017).
- e) Reestablish a standing Pilot Plant Committee to oversee the goals above (2014).

**Sensory Evaluation Center Goal: To be the premier university based sensory research and training facility in the United States**

- a) Train the next generation of sensory technologists and sensory scientists for careers in industry or academia.
  - i. Support graduate student and faculty research by providing a high throughput infrastructure for testing human participants.
  - ii. Provide wage payroll opportunities and summer internships to support the development of undergraduate students in Food Science.
  - iii. Give graduate and undergraduate students the opportunity to participate in applied projects for external partners
- b) Partner with internal and external clients to deliver high quality sensory data
  - i. Collaborate within the university to support multidisciplinary research projects
  - ii. Provide testing services for local and national companies on a fee for service basis.
- c) Advance the field of sensory science by supporting original scholarship and knowledge dissemination.

## DEPARTMENTAL OPERATIONS

The Departmental Operations section addresses the ability to efficiently utilize our facilities and resources in order to promote our Department and programs in a positive atmosphere that reflects our values. During the past year, the College underwent significant changes as a result of the departmental restructuring process. One of the goals of the restructuring process was to have consistency across functions and units. Several College functional teams are in the early stages of examining day-to-day administrative functions to determine where processes can be streamlined and to develop best practices that can be shared across all units.

The day-to-day administrative support provided to the University, College, faculty, and students by staff are in the following functional areas:

- 
- Administrative support – general office support in greeting and assisting others
- Communications, outreach and alumni relations
- Customer service and satisfaction
- Facilities, lab management and safety
- Financial management and grant support
- Human resources
- Student and academic services

While funding resources for personnel is limited within the College and University and workload demands are constantly changing, we need to develop new ways of conducting the day-to-day business operations in to improve our services without sacrificing quality or quantity. In other words, we need to find ways to work smarter—not harder. To ensure our dedicated staff can be successful in their positions and support the College’s restructuring efforts, we propose the following goals specifically aimed at assisting staff be more successful, skilled, knowledgeable, and highly performing in their positions.

### Goal 1: Streamline internal processes

- a) Identify and prioritize our top most critical and key internal processes and conduct a SWOT analysis;
- b) Identify strengths or processes that work well;
- c) Identify where there are gaps in processes and/or communications, weaknesses or barriers; and
- d) We will work with other units and the College to streamline processes and share best practices.

### Goal 2: Staff Cross-training

- a) Design a cross-training effort that will permit staff to learn how to do the job duties of others, which will promote communication as well as provide opportunities to the staff to advance at Penn State.

**Goal 3: Professional staff development**

- a) Identify skills, knowledge or other tools that staff need to be successful in their positions; and
- b) Identify professional development opportunities or provide workshops for the staff to ensure they have the ability to improve their skills as more technology is being implemented at the university.

**Goal 4: Staff rewards and recognition**

- a) Implement a departmental staff rewards and recognition program; and
- b) Staff's participation in training and cross-training will be recognized in their annual salary increases.

In addition, we want to continue to promote a welcoming and inviting climate for new faculty, staff, graduate and undergraduate students, postdoctoral scholars and international scholars as they enter our Department to ensure a successful start in their new positions within the Food Science Department. Research shows that onboarding programs and socialization techniques lead to positive outcomes for new employees such as higher job satisfaction, better job performance, greater organizational commitment, and reduction in stress. As a result, we would like to develop a list of resources, tips and other information to help provide a welcoming atmosphere and acclimate new members to our department, College and University. Again, this tool can be shared across units and within the College.

The timeframe for implementation is below:

2013-14	<ul style="list-style-type: none"> <li>• Increase staff support through communication</li> <li>• Identify top critical processes and conduct SWOT analysis</li> </ul>
2014-15	<ul style="list-style-type: none"> <li>• Implement cross-training program</li> <li>• Identify professional development opportunities</li> <li>• Ongoing SWOT analysis of non-critical tasks and processes</li> <li>• Implement staff rewards and recognition</li> </ul>
2015-16	<ul style="list-style-type: none"> <li>• Create an orientation program for welcoming new members to the department</li> </ul>
2016-17	<ul style="list-style-type: none"> <li>• Ongoing streamlining of processes and procedures</li> <li>• Staff professional development resources and support</li> <li>• Staff rewards and recognition</li> </ul>
2017-18	<ul style="list-style-type: none"> <li>• Continues process improvement of all aspects to ensure staff success</li> </ul>

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## RELATIONSHIP TO THE COLLEGE OF AGRICULTURAL SCIENCES 2014-15 THROUGH 2018-19 STRATEGIC PLAN

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At the time of this writing, the College Strategic Plan is still in development. The following is in response to the tentative goals provided by the CoAS as of February 3, 2014.

### **Goal A: Enhance Student Success and Optimize Enrollment**

Our goals for both undergraduate and graduate education align directly with this College goal.

### **Goal B: Empower the Engines of Discovery and Application**

#### **Cross-cutting Research Themes**

##### **Environmental Stewardship and Resilience**

*Providing innovative research to enhance and protect managed and natural ecosystems, ecosystem services, and human wellbeing.*

##### **Integrated Health Solutions**

*Advancing and improving the health of humans, animals, and communities through research into preventative, corrective, diagnostic, and predictive solutions to challenges presented by lifestyle, diseases, pests, and toxins.*

##### **Advanced Agricultural and Food Systems**

*Transforming thinking and practice in agricultural and food systems through research focused on productivity, sustainability, and adaptability.*

##### **Biologically-based Materials and Products**

*Discovering novel approaches to use genetic systems and biological materials as sources of sustainable feedstocks for value-added commercial and consumer products.*

##### **Global Engagement**

*Providing global solutions to challenges in agriculture, health, and sustainability that impact the future of an interconnected world.*

Between our current activities and our stated initiatives, the Department of Food Science aligns squarely with at least four of these five cross-cutting themes of the CoAS.

### **Goal C: Create Dynamic, Customer/Stakeholder Focused Educational Products, Services, and Impacts**

Our goal of conducting a needs assessment and acting upon it will assure that our outreach/Extension programs are dynamic and customer focused.

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## RESOURCES AND PRIORITIZATION

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The majority of the initiatives outlined in this plan do not require additional resources and will be accomplished as part of normal departmental operations. However, investment will be required for new initiatives in a number of areas.

### **Research:**

To maintain a vibrant research endeavor requires a critical mass of faculty and regular addition of new perspectives. Over the course of this 5-year plan it is anticipated that at least 3 and as many as 5 tenure track faculty will retire. While not arguing for a one-to-one replacement of these faculty members in terms of expertise, it is **critical** these faculty positions be maintained. In addition we seek new resources to grow expertise in **Food Safety, Security and Sustainability** and in the area of **Food Choice**. (Research Goal 1a). Other requests for new faculty positions are included at the end of this section.

In support of research as well as the graduate program we will need assistance from Development to aggressively work towards establishing endowed chairs, as well as in identifying and cultivating non-traditional sources of funds for assistantships (Research Goal 1c and Graduate Education Goal 2e).

### **Outreach:**

Proposed initiatives in Outreach and Extension will require support for development of on-line courses (Outreach 2a). In addition, to expand the reach of Food Safety and Quality efforts, investment will be required in County-based Educators with expertise in these areas. Finally, to support the Nutrition-focused extension efforts we request a Faculty-level hire with expertise in a relevant area (position description currently with the Dean).

### **Undergraduate Education:**

As a result of recent growth in the undergraduate program additional investment will be required to upgrade and maintain state-of-the-art microbiology and teaching laboratories. One approach we will explore is development of laboratory fees for specific courses which would allow use of DA for this activity (Undergraduate Goal 1-C). Additional resources will be required to explore and develop on-line versions of FDSC 105/200/or new courses (Undergraduate Goal 1-D).

As mentioned in the text for the Undergraduate goals, if the College would like us to pursue increased enrollment in the Food Science major, we will need additional FTE's in teaching or full time instructors to assist with offering the program (Undergraduate Goal 2-A). This is especially true if we choose to move forward with a new, sensory science-focused major (Undergraduate goal 3, also Research Goal 1-a). To maximize utility of the pilot plant will require a dedicated Pilot Plant Specialist. The model for funding this position is still under development. While not

relying entirely on the College for support, we would request half-time support for this position (Undergraduate Goal 2-B).

### **New Positions:**

First, when John Floros left, we had two faculty positions (microbial ecology of the human gut and biomolecular materials science) that had been approved but remain unfilled. As part of his hiring package as Department Head, Dr. Roberts secured two positions (not including the backfill for his own position), which may or may not be those previously identified. Position Descriptions for future hires are included as Appendix 5. We also support the college initiative for an Extension nutrition/health faculty member responsible for community nutrition education and programs (*Outreach* Goal 2e).

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## **DIVERSITY PLANNING**

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The Department will work with the College's Office of Multicultural Affairs under the direction of Dr. Patreese Ingram to develop a recruiting program at both the undergraduate and graduate levels. We will engage our alumni, especially those in urban and periurban areas, in this effort. We will develop strategic relationships with undergraduate institutions with diverse student bodies, e.g. the University of Puerto Rico, to recruit graduate students. We will continue to seek funds, e.g. fellowship programs, that support a diverse student body. We recognize that our faculty is less diverse than we would like, and will work diligently to identify and hire diverse colleagues.




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## **UNDERGRADUATE LEARNING OUTCOMES ASSESSMENT**

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High placement rates for our food science graduates continue despite the increase in number of graduates and the slow growth in the jobs market nationally and internationally (though it has been more difficult for foreign nationals to find employment in the U.S.). Companies continue to recruit heavily in the Department, ca. 15-20 company visit per year, an indicator of the perceived quality of our program.

Undergraduate program assessment in the Food Science department is being conducted according to a five year plan. Each year, one of the five outcomes listed below will be assessed (currently mid-year 2).

1. Students will be able to describe the chemical composition of foods, the properties and reactions of food components, and analyze the major and minor components of foods.
2. Students will be able to identify and characterize beneficial, pathogenic, and spoilage microorganisms in foods, and to use their knowledge of microbial growth, injury, and cell death to control the growth of microorganisms in foods and to solve applied food microbiology problems.
3. Students will apply the fundamental principles of engineering and unit operations related to preservation, packaging, and cleaning and sanitation in order to manufacture safe and nutritious foods.
4. Students will be able to apply the fundamental concepts central to Food Science (e.g. engineering, microbiology, chemistry, etc.) with consideration for the legal, economic, and ethical constraints surrounding food production and consumption.
5. Student will evaluate how people interact with food with respect to biology, behavior, and culture.

This assessment is being carried out by the Undergraduate Program Committee (UPC; which includes an undergraduate student rep). The UPC wrote the program outcomes listed above, determines which courses should be assessed, and what data be collected. The assessment coordinator is charged with assembling the annual report.

From the process of assessment thus far, we have gained several insights. As we began the process in 2012, we realized that our comprehensive list of program objectives was too detailed and were more appropriate for individual courses. This led to creation of the revised program outcomes listed above. We also realized the need for an assessment coordinator to lead the effort, keep track of deadlines, and assemble the final report. As a department, we feel it is important for all instructors to be involved in assessment but nominating an assessment coordinator has helped to streamline the process. Overall, we learned that our students are doing well based on the sizeable proportion of students meeting the mastery criterion. This established the baseline for our program, from which we can work to improve in the future. Based on the assessment data collected, the program will be reviewed for a renewal of its accreditation by the Institute for Food Technologists (IFT) in August 2014.

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## **PRACTICES PROMOTING INTEGRITY AND ETHICAL BEHAVIOR**

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Dr. Donald Thompson, professor emeritus of food science, is a current faculty member in the Rock Ethics institute. The department will continue to support programs of the Rock Institute dealing with the ethical dimensions of food and agriculture. Research ethics are stressed in such courses as FD SC 497B, Getting Ahead in Research: Learning to Communicate Scientifically, at the undergraduate level, and FD SC 501, Research Methods, at the graduate level. All course syllabi contain statements on academic integrity.

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## SUSTAINABILITY PENN STATE

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Penn State's Strategy Framework for Sustainability identifies five areas within which units will contribute to the University's sustainability vision and mission.

1. Teaching and co-curricular: Faculty will begin a dialogue on sustainability in the food industry with the inclusion of at least two speakers on the topic in the departmental seminar series for 2014-15.
2. Research: We will consider making the Berkey Creamery a "Living Laboratory" for sustainability in the food industry through the application of Re-invention Funds and working with the best practices as identified by the dairy industry. Our contacts at the Dairy Management Institute (DMI) and throughout the dairy industry will be instrumental in this activity.
3. Service and Community Engagement: As we develop a better internal understanding of sustainability as it pertains to food manufacturing we will develop outreach programming for small and medium scale processors located in Pennsylvania.
4. Operations: the facilities coordinator will update the faculty and staff on sustainability initiatives at Penn State at least once/semester, and identify opportunities for improvement in sustainability within the Food Science Building.
5. Goverance and Adminsitration: The Department, in cooperation with the College of Agricultural Sciences will determine how best to implement sustainability in to the government and administrative activities of the Department.

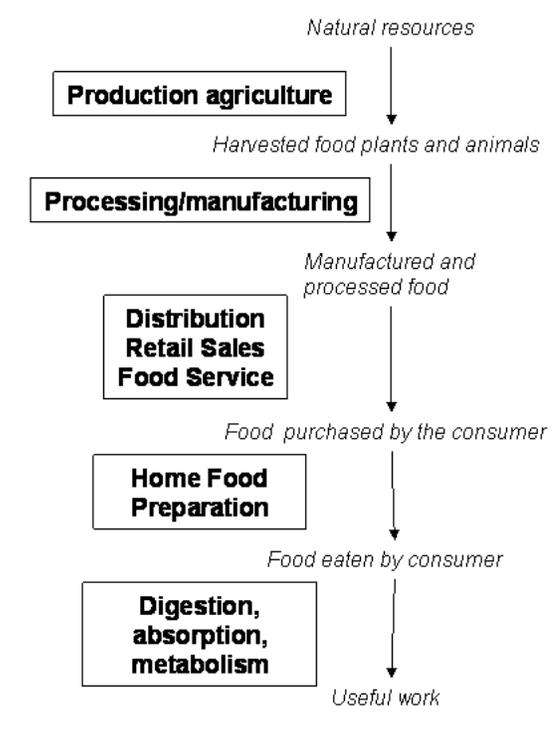
## APPENDIX 1

### THE ROLE OF THE DEPARTMENT OF FOOD SCIENCE IN THE FOOD SYSTEM

**What is "the" Food System?** The food system may be thought of in several complementary ways:

- As a system within the larger economic environment, as part of a “consumer culture.” As a segment of the economy. It includes all those activities contributing to the generation of food (meaning what the consumer eats).
- As a hierarchical set of systems: local, regional, national or international.
- As a description of paths of information flow and its interpretation, especially from customer to provider.
- As a description of customer/provider relationships. In each relationship the provider must understand the desires of the customer, and ideally the relationship will take into account the desires of all customers beyond that up to the consumer.
- As a description of the paths of material flow toward consumer. As such, it can be useful for determining economic "value added."

In the context of this plan it is most helpful to focus on the last, “material flow” view of the system. A highly simplified figure summarizing some of the steps in this system is shown right. Production agriculture is all of the processes of growing plants and animals and converting them to products not directly consumable. Food processing and manufacturing is all of the steps needed to convert these products into something that can be sold as food or a food ingredient. This might be as simple as a farmer washing apples for farm-gate sales but more likely involves some industrial operations at another site (e.g., processing the apples to make canned pie filling or pectin to sell to a jelly manufacturer). The next steps describe the diverse paths that these products may take before being purchased by the consumer. Often this will involve a wholesale-retail chain but the food service path is increasingly important. The purchased food may be subject to further processing by the consumer in the home (i.e., cooking) but is finally eaten. The last stage of the process takes place inside the human body and describes the breakdown of food molecules and their biological use. This does not describe all of the food eaten but is probably valid for most of the typical American diet.



In a free market, the driver of material flow in this system is consumer preference as perceived by the suppliers (hence information flow in the reverse direction is crucial to understanding the above diagram). However, consumer preference may only be expressed in response to choices offered. Food companies will typically exert as much influence as possible to harness the power of consumer choice in the food system for economic gain. A food product is a brand which draws value from both its material properties and also from the psychological and sociocultural benefits it brings to the consumer. A food company seeking to increase its brand value may seek to use food science to improve the material properties of the product but will often resort to marketing in an effort to influence the intangible aspects. In practice, working food scientists often report to a marketing department and this relationship reveals the fact that material properties are only one contribution to the overall brand value of the product. Importantly a consumer's *perception* of the product is likely to have huge influence on the purchase decision and hence the whole food system regardless of the actual material properties.

The food dollar is not equally spread over all sectors of the system and is concentrated approximately equally in the food service and food retail sectors, significantly less in the food processing/manufacturing sectors and much, much less in the production agriculture sectors. The College of Agricultural Sciences is skewed almost exclusively to the production side of the system and the Department of Food Science to the processing and manufacturing sectors.

### **What is Food Science, and how does it relate to "the" Food System?**

Food science is currently understood among its practitioners in the US as a group of disciplines (chemistry, microbiology, engineering, nutrition) brought to bear on scientific and technical questions concerning the material nature of food. Often the questions addressed by food science are related to practical problems associated with unit operations in food processing and manufacturing. Since industrial processes are designed based on engineering principles (even if based on recipe knowledge), answers to the science questions are often applied based on engineering-based analyses. There is no conceptual basis for excluding a scientific discipline from food science as long as it may be brought to bear on food-related questions. The traditional emphasis on certain disciplines is largely historical. Food science is not itself a discipline.

Scientific and technical questions concerning the material nature of food can occur at any stage of the food system. Typically these are focused in the processing and manufacturing sectors but may arise during animal and plant production, distribution, in food retail and service sectors, during home preparation or even in the food as it passes through the human body.

Food science is important in transforming the economic value of agricultural produce as it contributes to the viability of the processing and manufacturing sectors, in particular the food industry. An important contribution of food scientists is to product and process development. Increasingly the recipe for new products is developed by culinary artists and marketers, and then transferred to food scientists/technologists to make it practical for mass manufacture and marketing. Marketers define a food product for the consumer; food scientists and

technologists make it possible. Another major responsibility of the food scientist in industry is in trouble-shooting technical questions, sometimes in real time, in processing or manufacturing. The speed and volume of large-scale processing places a premium on the knowledge of a person who can quickly solve such problems. People of wide academic and non-academic backgrounds are involved in both of these problems and so there is again a premium on being able to work with people who see the problem from a different perspective. Communication skills are critical under any circumstances, but there is a special premium on them when working with a team under pressure.

Our treatment of the food system so far focuses on the transformation of materials and the consequent development of an economic system driven by consumer choice to which food science contributes. However, the product choices made by the consumer and influenced by the contribution of food science to formulate products and influence their brand value constitute a diet, and diet constitutes a huge influence on health and wellness. Therefore consumer health and wellness is an important indirect outcome of the practice of food science not immediately obvious in the material transformation model proposed. How then can food science connect to nutrition?

Nutrition is generally considered as a component discipline of food science. However in practice the treatment of nutrition in Food Science curricula is often cursory (IFT requires only a single class and nutrition was strikingly omitted from the learning outcomes required as part of program evaluation) and academic collaborations between food scientists and nutritionists are limited. One useful, but conservative, application of nutrition in food science as a contribution to the "health and wellness" of consumers would be to study the classical food chemistry and microbiology-associated questions related to potential bioactive components in or added to foods. More aggressive application of nutrition would be to attempt to determine the nature of bioactivity of foods and their components or to study the effect of food components on host metabolism (nutrigenomics). In either case, it would seem that close collaboration with faculty members in nutrition programs would be appropriate. Food science expertise is also well suited to the study of food structure/functionality within the colon for example, an area about which little is known. Food microbiology might be reasonably expanded to include this milieu, and the nature of food ingredients which influence it, including prebiotics and probiotics, would fit naturally as well.

Of course, the health and wellness outcomes are strongly coupled to commercial outcomes of food science, as many food companies maintain a strong interest in nutrition as a marketing tool. Importantly, the marketing value is driven by consumer belief in the health outcomes and only indirectly by scientific evidence which leads to potential ethical issues associated with the development and marketing of "healthy" foods. Ingredient advertisements in trade journals often refer to what consumers think rather than the scientific evidence. Structure-function claims allow one avenue for nutrition/health marketing on the food label, and even a simple declarative statement (e.g., with added isoflavones) may be sufficient to influence consumer behavior. Both seem to be preferred over the insipid language of "qualified" health claims.

### **The Penn State Department of Food Science and its relation to “the” Food System**

The Penn State Department of Food Science emphasizes the core disciplines of food chemistry and food microbiology in a traditional way. In food chemistry, a major emphasis is on ‘ingredients as materials.’ This approach addresses ingredient technology from a “functional properties” perspective, but instead of characterizing functional properties by idiosyncratic empirical methodology (e.g., foaming capacity), it attempts to describe physical behavior in more fundamental terms. An attempt is made to relate chemical structure to physical function at scale levels from the molecular to the macroscopic. More recently, we have begun to explore the ways the chemistry of food affects the biochemistry of the human body and health outcomes for the consumer.

Food microbiology is a field of study that integrates and applies knowledge within the disciplines of Food Science and microbiology to preserve, process, package, and distribute foods that are wholesome and safe to eat. The department has particular strength in destruction of foodborne pathogens (notably in meat, dairy foods and plant products) with a strong outreach focus. The growth of microorganisms in fermentations and as probiotics is also studied. In addition to research concerning microbial food pathogens, strong outreach programs are in place for state and regional industries.

Food engineering is limited in scope within the department per se. Additional capacity is available in the Agricultural and Biological Engineering department. The Center for Food Manufacturing is administered through the department and provides contact with numerous companies. Aspects of food engineering are evident in the departmental emphases on processing and manufacturing of foods of special importance to PA in particular mushrooms, dairy products, and confectionery. The new pilot plant facilities (wet, dry, and pathogen pilot plants) offer an opportunity to enhance our engineering capabilities.

The Berkey Creamery manufacturing facility and the salesroom are a unique resource administered though the Department of Food Science. The manufacturing facility provides opportunities for student internships and for demonstrating concepts in undergraduate coursework. The creamery is also a major contributor to



many processing and manufacturing outreach programs through the department. Further integration of the creamery manufacturing plant into departmental programs represents an important opportunity. The visibility of the Berkey Creamery provides an opportunity to educate the University community about the food system and the role of Food Science in it.

Nutrition is currently represented in the department by a joint position with the Department of Nutrition collaboratively teaching FD SC 406, and through cross-listed courses on ingestive behavior and food addiction. A large nutrition science program and a much larger nutrition education/dietetics program exists in the Department of Nutritional Sciences (located in the

College of Health and Human Development). Nutrition elsewhere in the College of Agricultural Sciences focuses on animal nutrition. The increasing consumer interest in health and wellness through food argues that food scientists educated in our programs should be well grounded in nutrition and recent efforts have sought to develop better research and teaching relationships with the Department of Nutritional Sciences.

The Department previously had three faculty positions supporting Extension in nutrition education. Current Extension efforts tend to aim at providing technical support for small and mid-sized companies, not in a proprietary way but group-wise after identifying needs in common with industry sectors. A special feature of our department is the number and breadth of the courses designed for industry specific industry segments.

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## APPENDIX 2

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### DEPARTMENTAL PERFORMANCE METRICS

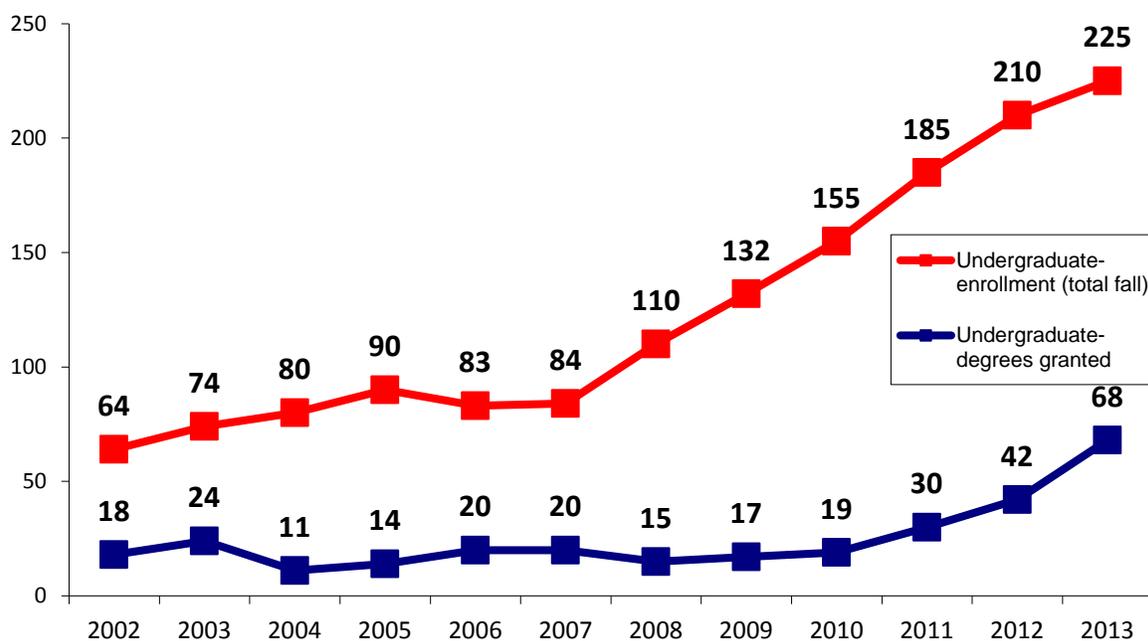


Figure 1: Total undergraduate enrollment

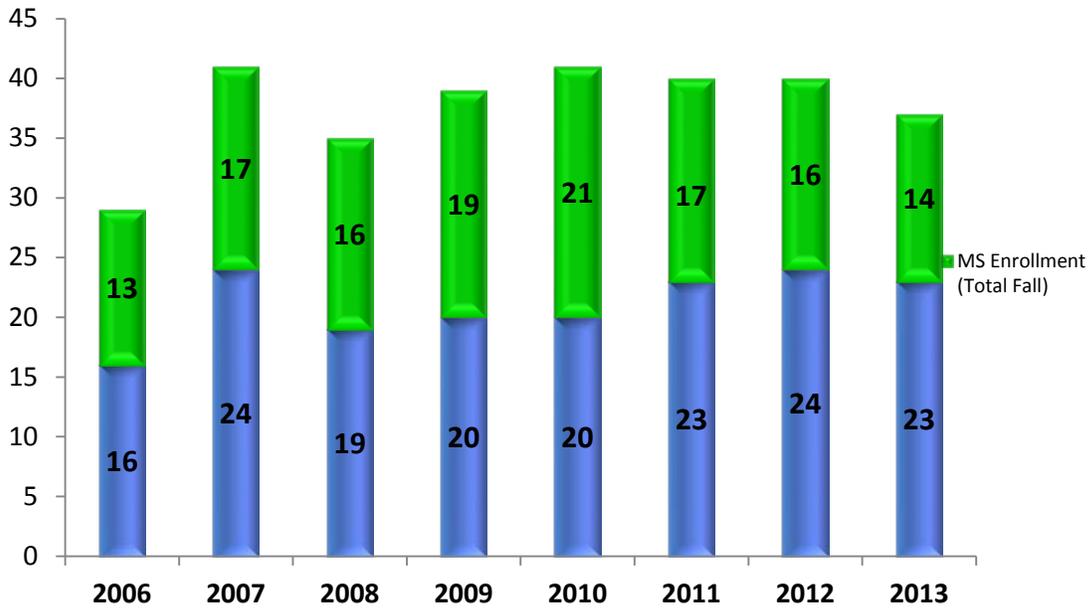


Figure 2: Number of MS and PhD

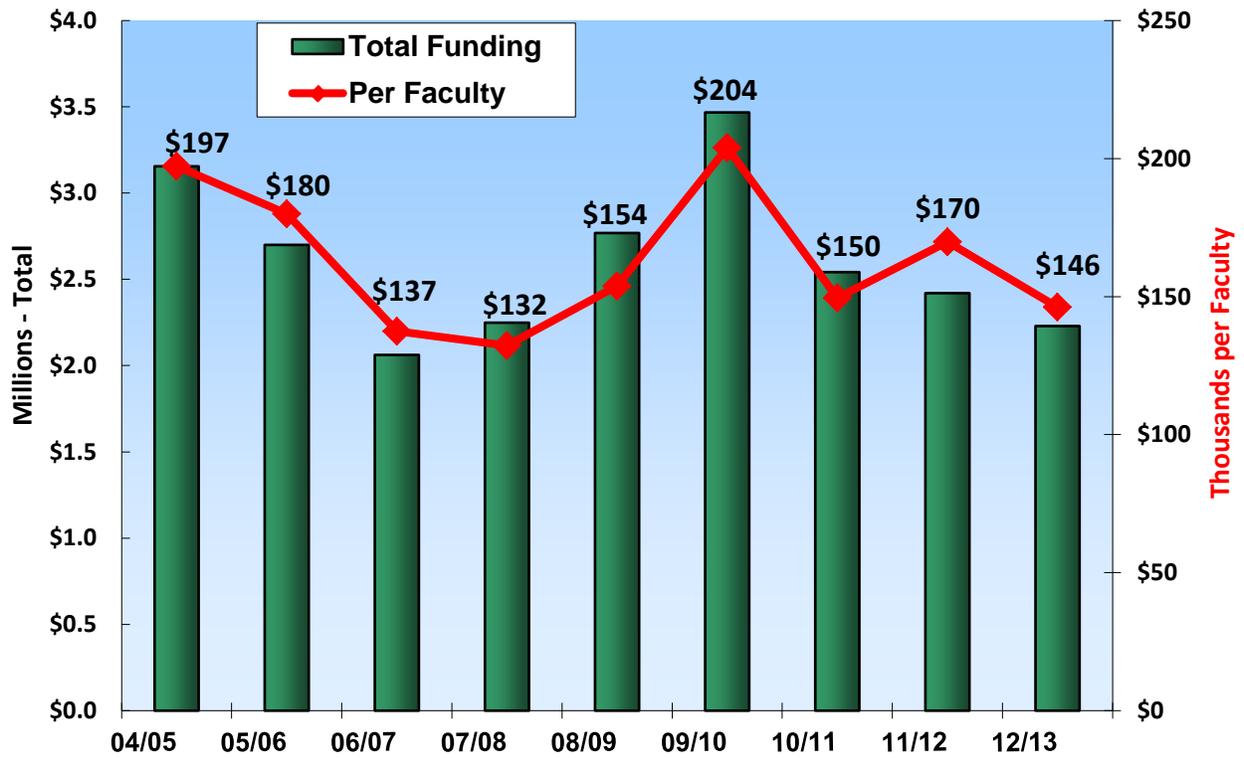


Figure 3. Research funding

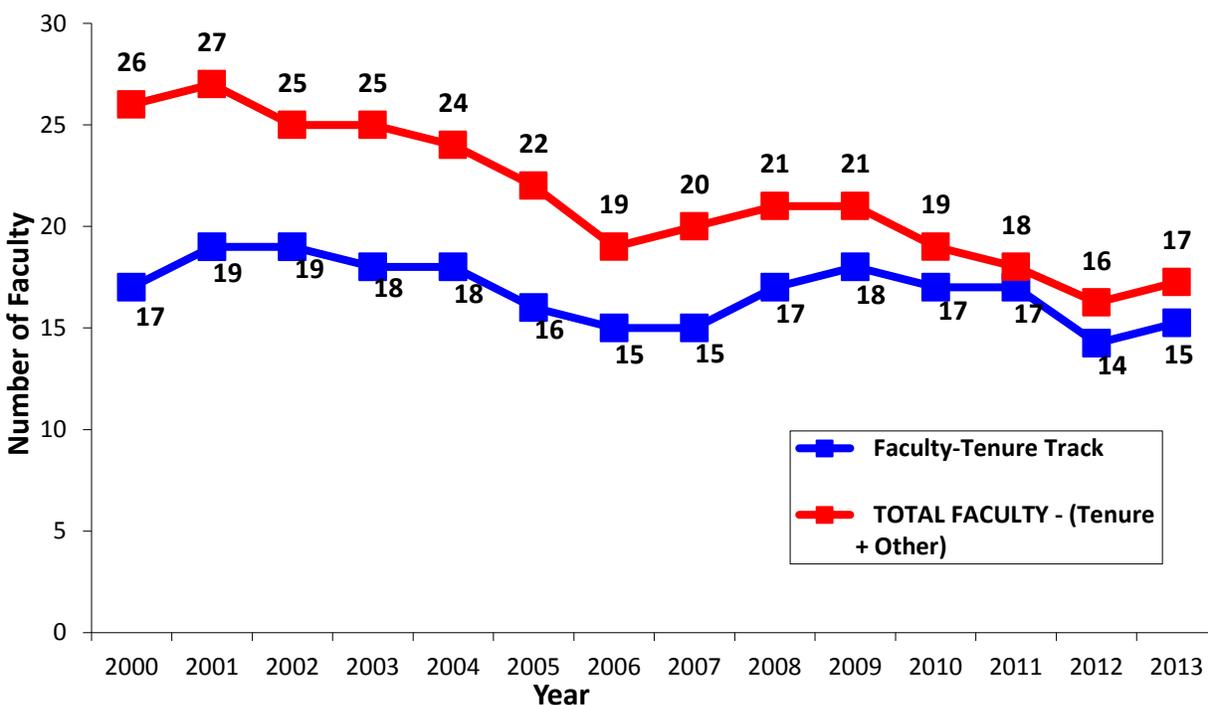


Figure 4: Faculty Headcount

### APPENDIX 3

#### HISTORY OF STRATEGIC PLANNING IN THE DEPARTMENT OF FOOD SCIENCE

Food Science at Penn State began in 1966 when faculty members from the Dairy Science, Horticulture, Animal Science, and Poultry Science Departments initiated the Division of Food Science and Industry to administer an undergraduate program in Food Technology and a graduate program in Food Science. The first undergraduate and graduate degrees were awarded in 1968. In 1970, the name of the undergraduate program was changed to Food Science. In 1975, the Department of Food Science came into being, composed of faculty members from Dairy Science (9, from Dairy Manufacturing), Horticulture (3), Animal Science (2), and Poultry Science (2). The formation of the new department represented a decision to move away from vertical integration in the four commodity departments and to establish a new interdisciplinary unit. The considerable discussions concerning the rationale for initiating the Division, the programs, and the department will not be described here, even though these discussions were certainly strategic in nature. It is worth noting that the resources of the department at its inception were primarily the faculty positions, not technical support. In addition, the faculty members were spread over four locations: Borland Lab, the Horticultural Processing Lab, the Meats Lab, and the Poultry Processing Lab. Insight into the status of the incipient department may be gained from the September 1975 USDA Review of the program (by the time the report was received, the department had been formed). A subsequent USDA Review (of the research in both the Food Science and Nutrition programs) was conducted in

March, 1979. These two reviews were research reviews conducted by the USDA to monitor the use of Hatch funds. While guidance from the review team is implicit in the reports, they cannot be considered to represent strategic planning by the department.

In 1982, College of Agriculture Dean Smith requested that departments prioritize teaching, research, and Extension programs. In December, the faculty discussed and approved three one-page reports, which were combined and transmitted by then-head Phil Keeney to Dean Smith. An April, 1985, document prepared by Phil Keeney for the 1985 CSRS Review Team included a two-page section on the mission and priorities of the department. The teaching and research priorities were verbatim from the 1982 reports.

In July of 1985, Associate Dean Jim Starling requested that each department develop plans to respond to a 20% increase or a 20% decrease in faculty numbers. On the basis of discussion at three Food Science faculty meetings, Phil Keeney prepared a report that was further reviewed by the Food Science faculty before it was transmitted. The following Fall the new department head, Lowell Satterlee, prepared a document titled "The Strategic Plan. Food Science One Year Later." From the title it is clear that this document implicitly considered the 1985 report to have been a strategic plan.

In 1990, Lowell Satterlee convened an *ad hoc* committee (Dimick, Kuhn, Marezki, Thompson) to consider "the strategic plans for Food Science teaching, research and Extension, how these plans relate to one another, and how they will eventually create the department's strategic plan." In September a four-page preliminary draft was sent by Lowell Satterlee to Jim Starling, and in October Gerry Kuhn shared with the Food Science faculty a much-revised final document.

In November, 1991, at Lowell Satterlee's request, the Food Science Administrative Advisory Committee (Dimick, Knabel, Marezki, Thompson, and Ziegler) initiated discussion about "how we can move forward to complete the strategic planning process for the department." At about this time, Lowell Satterlee announced he would step down as head as of April, 1992, and Gerry Kuhn agreed to serve as interim head. Discussion of strategic planning became very much a faculty-driven exercise. A two-day retreat was held February 29 and March 1, 1992 (planned and run jointly by Satterlee, Kuhn, Knabel, Thompson, and Ziegler), at which strategic issues for research, teaching, and Extension were identified. In March, Lowell Satterlee appointed a Strategic Planning Committee (Ziegler, chair; Thompson, vice chair; Marezki; and Beelman) to take over strategic planning from the Administrative Advisory Committee. The third in a series of subsequent departmental strategic planning meetings was held all day August 6 and continued August 10. Based on these three sessions, a draft document (dated August 24) was put together and circulated by Greg Ziegler in September to the faculty for comment (in academic year 1992/93 the Strategic Planning Committee was Kilara, chair; Beelman, Brown, Miller, and Ziegler).

While the department was working toward a grass-roots planning document under interim leadership, the University and the college were also engaged in an important strategic planning activity, referred to as the "Futuring Process." A College Future Committee (CFC) had been

named, and by early October a draft with recommendations was produced. Because this document made several recommendations considered inimical to the interests of the Food Science faculty, the faculty immediately applied its strategic energies to responding to this document. The response communicated to the college drew upon the strategic thinking in the department to date. An unfortunate effect of the CFC activities and CFC report was that the departmental strategic plan never progressed past the draft stage. Although the faculty did not further formally consider the draft plan, a related strategic plan did appear in a Departmental Handbook in 1993, titled "Partial Strategic Plan Developed by the Food Science Faculty."

In November and December of 1993, incoming department head Don Thompson worked with the Strategic Planning Committee (Beelman, chair; Brown, Miller, Kilara) to draw up a thoroughly revised draft document to serve as the basis for a two-day retreat in January. By the end of January a completed plan was printed and distributed to the faculty, including five-year goals and one-year action plans. For the remainder of that planning period the Strategic Planning Committee organized an annual two-day retreat to consider revisions to the five-year goals and to construct new action plans. In September 1996, a formal external review of the department was conducted. The review team was asked to make its primary objective a critique of the strategic plan. In its report, the team stated, "the department has developed a flexible, well thought-out strategic plan that appears to have broad faculty input and buy-in that will provide a flexible blueprint for charting the department's future course."

The 1998 Strategic Plan took into account two important changes in the planning environment at Penn State in 1997: in March the College of Agricultural Sciences published a completely new Strategic Plan, and in September the University Planning Council distributed a wholly new University document, "Planning for the Twenty-First Century." In addition, Bob Steele, Dean of the College of Agricultural Sciences, visited a Department of Food Science faculty meeting in December 1997, to provide specific feedback on the departmental strategic plan. As a result of the changed planning environment, the revisions made that year were more extensive than in previous years.

Although the 1999 Strategic Plan continued to be a document revised yearly, but looking five years into the future, the 1999 Strategic Plan differed from previous plans in some fundamental ways. For the first time, Strategic Goals were written in terms of the desired outcomes of our efforts rather than as the efforts themselves. Consequently, the Action Plans became the statements of what would be done and performance indicators related to each Strategic Goal as measurements of impact (although not comprehensive ones).

The 2000-2004 Plan was developed in the early weeks of 2000, and it was conceived as a rolling five-year plan for the period 2000-2004. Incoming department head John Floros participated in the January planning retreat, and this is the plan that was in effect when he joined the department that July. The plan remained in effect until the 2003-2007 planning effort was initiated early in 2002 with a February planning retreat attended by faculty, staff and students. The retreat dictated a substantial re-examination of the integration of departmental activities, and that re-examination naturally led to substantial changes in the strategic plan. As with previous strategic plans in the Department of Food Science, this version was a rolling five-year

plan. The Strategic Goals were understood to be for the five-year period from July 1, 2002, through June 30, 2007. The Action Plans referred to those things that would be accomplished in the period from July 1, 2002, to June 30, 2003 and were intended to be revised each year based on progress. Much thought went into development of appropriate and useful Performance Indicators. The Performance Indicators relate most directly to the Strategic Goals, and were selected to give us insight into our progress toward those goals. In addition to working with the department head, John Floros, the Strategic Planning Task Force (SPTF) (Thompson, chair, Anantheswaran, Maretzki, Merrill, Palchak, and Robert Roberts) worked with the Chairs of the Programmatic Committees and of the Impact Groups in an iterative manner as appropriate. Consequently, the development of this Strategic Plan reflected extensive input from faculty and staff members.

The Food Science strategic planning committee (SPC) was appointed in February 2005 by the department head, John Floros, and consisted of faculty and staff with responsibilities in teaching, research, outreach, administration, and creamery operations (Coupland, chair, Brown, Knabel, Thompson, Ziegler, Merrill and Ford). The faculty members on this committee served on one or more of the CoAS's focus study groups that played an integral part in the college planning process. At the committee's request, the department head was also an active member of the committee. The SPC employed a number of resources during its planning process including the college's 2005-2008 strategic plan, the department's previous plan, input from internal and external stakeholders, the CoAS Food Science Study Group's report, other units' strategic plans as well as information specific to other Food Science programs. Interestingly for the first time the college had taken a systems approach to its strategic plan and the report of the Food Sciences study group as part of this effort provided a useful starting point for the Food Science departmental plan. The department's external advisory board provided useful feedback representative of some of our external stakeholders. The board consists of leaders in the food industry, government and academia and since 2003 has reviewed and provided feedback and guidance on the department's programs and previous strategic plan. The board discussed a draft of this plan at an all-day meeting on April 2005.

To address internal stakeholders, an all-day departmental retreat was held (2/25/05) to gain input from faculty, staff, and students on topics centered on department values and working environment, future research foci, the undergraduate program and future departmental hires. In addition, a number of open discussions were held during March and April 2005 on specific issues relating to the future direction of the department and to gain specific input on proposed goals for the plan. These meetings were organized and led by the SPC and by other groups within the department who were assigned specific topics and issues to address. The SPC and Committee chairs encouraged an ongoing electronic dialogue. Before final submission to the Dean's office, the Food Science strategic plan was presented in draft to department members at a second retreat (5/13/05) and to targeted external groups such as previous members of the Food Science Study Group, the Food Industry Group (FIG) and the Food Science External Advisory Board for final review and comments.

The Department Head, John Floros, appointed the Strategic Planning Committee (Coupland, chair, Thompson, Ziegler, Lambert, Dudley, Knabel, Palchak, Ripka) and it convened in February

2008. The committee took an early decision to draw from the broad thematic initiatives in the 2005-2008 plan, but to take a more programmatic look at the breadth of the department's functions. The committee also decided to separate the quantity and quality of research from initiatives related to graduate education. The department held a retreat on May 30, 2008, and used the resources at the Team Decision Center to rapidly develop SWOT analyses for six major areas (research, outreach, undergraduate education, graduate education, academic support units and departmental operations). This data was used by the relevant programmatic committees and ad-hoc groups to develop drafts of the strategic initiatives proposed. The drafts were discussed at a day-long retreat with the Advisory Board (October 20, 2008) and then revised for a half-day faculty/staff retreat (November 14, 2008).

**The Current Planning Process** – The current planning cycle was initiated on July 26, 2013 with a email from Bob Roberts to the Strategic Planning Committee (Ziegler, chair, Azzara, Coupland, Cutter, Dudley, Elias, and Ripka). The bulk of four faculty meetings early during the fall 2013 semester were dedicated to planning, and a draft outline of the 2014-15 to 2018-19 plan was forwarded to the Dean's office (November 11, 2013). Bob Roberts made a presentation of the draft plan to a retreat of the College Unit Leaders on December 6, 2013. A one-day planning retreat was held at the Toftrees Resort and Conference Center (December 17, 2013). Feedback on the draft plan from that retreat was sent to the programmatic committees (GPC, OPC, UPC and departmental operations) to incorporate into revised goals and action plans. Revisions were incorporated into the current document and the Strategic Planning Committee made additional revisions, both by email and in a face-to-face meeting (January 28, 2013) prior to sending the draft plan to Bob Roberts. The final plan was revised by the Department Head and delivered to the College on February 17, 2014.

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## APPENDIX 4

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### STATEMENT OF VALUES

The department considers itself an intellectual community in which academic freedom and responsibility to the community are in harmony. In particular we value:

- An atmosphere of mutual respect that promotes open sharing and thoughtful consideration of opinions
- Creativity and innovation
- Cultural diversity
- Excellence and productivity in the scholarship of integration of education, research and service
- Leadership and teamwork
- Openness to change
- Research conducted in the context of graduate education
- The ability of food scientists to collaborate across disciplines and solve complex problems for the common good
- The competitiveness of the food industry
- The health and wellness of the population

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## APPENDIX 5

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When identifying the Department's needs for future faculty hires we considered the following questions.

- What would be required to make Penn State's Department of Food Science the "best," and what do we want to be known for?
- What are the Department's, College's and University's strengths on which to build?
- What are our present and predicted shortcomings?
- Are the potential collaborators and facilities conducive to success and are the areas fundable?

Based on our current situation, analysis of trends, and benchmarking against peer institutions, the following needs were identified (not in priority order):

- a) two positions in food safety, perhaps including virology or parasitology, these individuals would participate in the Center for Infectious Disease Dynamics or the Center for Molecular Immunology and Infectious Disease within the Huck Institutes
- b) food allergens, this individual would participate in the immunology and infectious disease program and could be shared with Vet. Sci.
- c) sensory science, this individual would add to our strength in food choice allowing us to offer a new major and assure that Penn State is the premier institution in this area
- d) microbial ecology of the human gut, this area is becoming a "must have" for food science departments interested in the influence of food on health. This could easily be a cross-cutting theme for the College, this individual could help establish a gnotobiotic pig research facility. This position could be shared with Animal Science.
- e) bio-based materials, especially food packaging materials. This position could be shared with ABE.

A need for expertise in food law and regulations was also identified, but would be covered through collaborations with e.g. the Ag Law Center of the Dickinson School of Law. We will also work with Extension to hire a nutrition specialist.

The following faculty positions were open at the time of writing the 2008-2013 Strategic Plan, and have not been filled. These positions are still relevant to the mission of the Department and College and have been retained with some modifications. If we were able to fill all the positions above, we would then be comparable to our benchmark institutions.

## DESCRIPTIONS OF OPEN FACULTY POSITIONS

### 1. Assistant Professor Food and Bio-based Materials Engineering/Packaging (75% research, 25% teaching)

**Research responsibilities:** Establish a strong externally-funded research program in food engineering, with an emphasis on materials science and engineering. Appropriate research areas would include food packaging, bio-based materials, nanotechnology, or polymer science.

Significant resources available to the successful candidate include access to extensive pilot plant facilities and high-end research instrumentation for materials characterization. The candidate will be expected to collaborate with colleagues in the Department of Food Science ([www.foodscience.edu](http://www.foodscience.edu)) and others across the University, especially the Materials Research Institute (<http://www.mri.psu.edu/>).

**Teaching responsibilities:** Develop and teach a graduate-level course in the candidate's field of specialization, and an undergraduate course on food packaging. Supervise graduate students in thesis research and advise undergraduate students.

**Qualifications:** Applicants should have a Ph.D. in Food Science, Food Engineering, Chemical Engineering, Materials Science and Engineering, or a relevant field of specialization. Postdoctoral experience is highly desirable. Applicant should possess a willingness to work as part of a multidisciplinary team.

### 2. Assistant/Associate/Full Professor of Microbial Ecology of the Human Gastrointestinal Tract 75% Research/25% Teaching

The Department of Food Science at the Pennsylvania State University is seeking a tenure-track faculty member (assistant, associate or full professor—depending on qualifications and experience) with an interest in the microbial ecology of the human gut. The successful candidate will be expected to develop a strong, externally funded research program that focuses on the influence of the microbial flora of the gut on the health of the human host. Potential areas of research interest include, but are not limited to, the influence of prebiotics on the intestinal microbial ecology; interaction of specific organisms, or groups of microorganisms with the host; development of strategies to enhance beneficial or inhibit pathogenic groups of microorganism in the gut; development of an understanding of the microbial population dynamics in the human gut as a function of diet and disease. Toward this end the successful candidate will be expected to take advantage of substantial opportunities for collaboration within the Department of Food Science ([www.foodscience.psu.edu](http://www.foodscience.psu.edu)) and other units in the College of Agricultural Sciences ([www.cas.psu.edu](http://www.cas.psu.edu)) including the Gastroenteric Disease Center ([www.ecoli.cas.psu.edu](http://www.ecoli.cas.psu.edu)), as well as across the university including the Department of Nutritional Sciences, the Huck Institute of the Life Sciences ([www.huck.psu.edu](http://www.huck.psu.edu)) and The College of Medicine and the Milton S. Hershey Medical Center ([www.hmc.psu.edu](http://www.hmc.psu.edu)).

**Teaching Responsibilities Include:**

- a) Develop and teach a graduate-level course in microbial ecology of the gastrointestinal tract and its effect on health and wellness
- b) Teach an undergraduate course in the candidate's area of interest/expertise or as departmental needs dictate
- c) Supervise graduate students in thesis research projects and advise undergraduate students.

**Qualifications for the Position include:**

- a) Ph.D. in food science, microbiology or related field, with a strong background in microbial ecology of the gastrointestinal tract and its effect on health and wellness
- b) Postdoctoral experience in the areas of microbial ecology of the gastrointestinal tract and the role of probiotics and prebiotics in health and wellness is highly desirable. Willingness to work as part of a multidisciplinary team on a systems biology approach to detect, track and control foodborne pathogens.

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**APPENDIX 6**  
**SUMMARY OF STRATEGIC INITIATIVES 2014-15 THROUGH 2018-19**

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**RESEARCH**

**Goal 1: Secure resources to support quality research**

**Goal 2: Facilitate collaboration both internally and externally**

**OUTREACH**

**Goal 1: Assess the department's role in the Pennsylvania food system**

**Goal 2: Address the research and educational needs of the food industry, food entrepreneurs, and the consuming public**

**Goal 3: Identify new and strengthen existing outreach partnerships at the departmental, university, state national, and international levels**

**Goal 4: Provide leadership and support to Cooperative Extension issues**

**GRADUATE  
EDUCATION**

**Goal 1: Assess and enhance the quality of the graduate program**

**Goal 2: Determine size of graduate student population needed to maintain a vibrant program, and develop strategies to maintain these numbers using external funding**

**UNDERGRADUATE  
EDUCATION**

**Goal 1: Improve the quality of undergraduate education in food science**

**Goal 2: Enhance recruitment and retention while improving student quality**

**Goal 3: Explore the creation of a new major in sensory science or related field**

**ACADEMIC  
SUPPORT UNITS**

**Berkey Creamery Goal: Use the processing facility to enhance the teaching, research and outreach endeavors of the department**

**Pilot Plant Goal: Enable the Food Science Pilot Plants to be state-of-the-art facilities supporting education, research, and outreach**

**Sensory Evaluation Center Goal: To be the premier university based sensory research and training facility in the United States**

**DEPARTMENTAL  
OPERATIONS**

**Goal 1: Streamline internal processes**

**Goal 2: Staff cross-training**

**Goal 3: Professional staff development**

**Goal 4: Staff rewards and recognition**