

## **Department of Food Science Strategic Plan: Part 1**

The Department of Food Science is the oldest Food Science Departments in the Nation; the major academic center for Food Science in New England; and the only research oriented Department of Food Science in Massachusetts. As such it has fulfilled the goals which were set for it on its inception at the University of Massachusetts as the Department of Horticultural Manufactures on April 27, 1918. It kept that name for 1918-1944 and then went through a period of evolution from the Department of Food Technology 1944-1962, to the Department of Food Science and Technology and then to the Department of Food Science and Nutrition in the period 1962-1988 and finally the Department of Food Science from 1988 to the present. The Department and its current faculty work in a creative and open environment developing policy and strategies as a whole which insures optimum discourse and follow through on our goals.

### **Department Mission**

The education of undergraduate, graduate and nontraditional students in the field of Food Science and the study and application of science and technology to further basic knowledge, add value, foster economic development and provide a safe, healthful and high quality food supply consistent with the mission of a Land Grant University.

### **Department Resources**

Faculty: The Department has 13 faculty members consisting of five professors and three associate professors and 5 assistant professors and an assistant extension specialist. The Department has several active adjunct and emeritus Professors including Fergus Clydesdale, Raymond Mahoney, Silvia Rowe, and Jochen Weiss. The Staff consists of one departmental assistant, one bookkeeper, a bacteriologist, EDP programmer, pilot plant manager and a Technical Assistant.

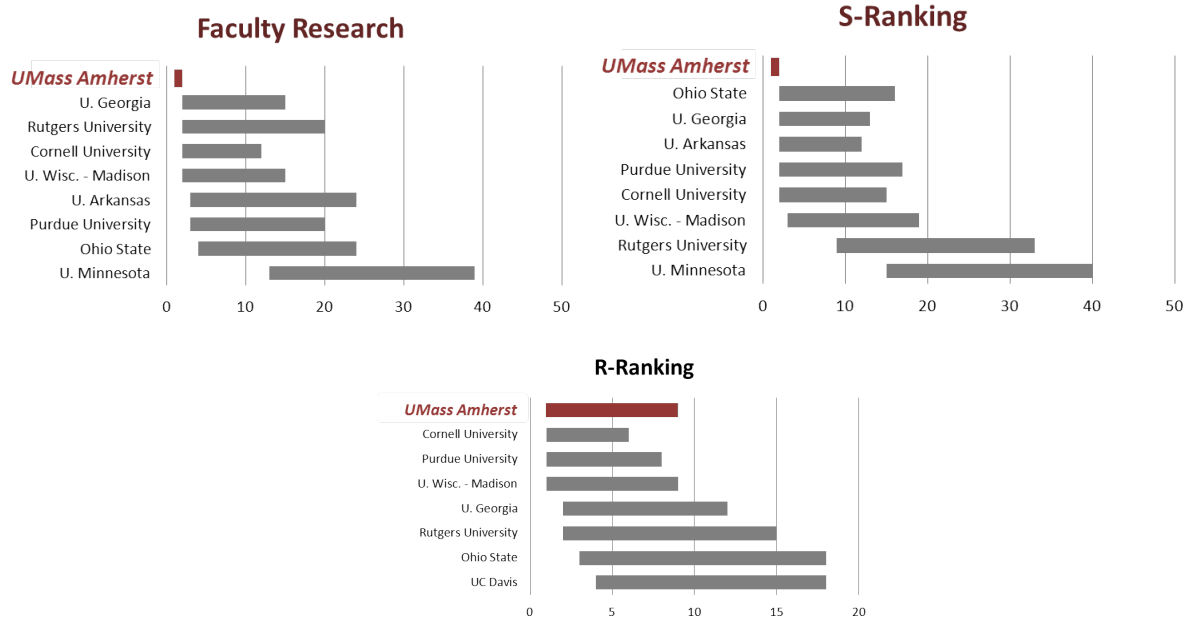
The Department's graduate students numbers (approximately 60% PhD), have increased 2.25 fold in the last 5 years to 68 students. The Department currently has 104 undergraduate student majors which is a 1.5 fold increase in the last 5 years. The Department also has 10-15 Post Doctoral Associates and 23-31 self-funded Visiting Scientists at any given time. The number of visiting scholars has increased from 12 to 31 since the time of our NRC ranking. These visiting researchers originate from all over the world thus not only bring excellent research productivity but also cultural diversity that benefits all of our students.

Advisory Board: The Department instituted an Alumni Industrial Advisory Board in 1989. This Board has 26 members, the majority of whom are Alumni plus several representatives from Massachusetts food companies. The Advisory Board is an extremely valuable resource for support, advice and counsel and often aid the Department in fund raising activities.

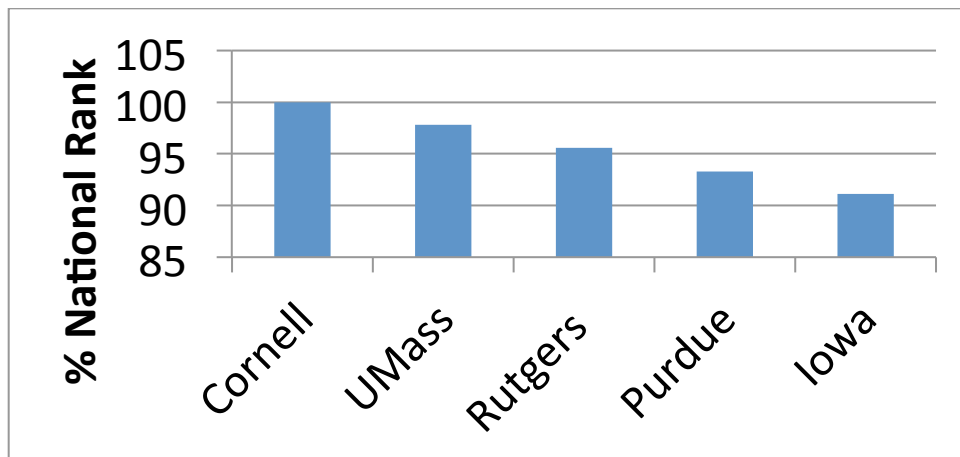
### **UMass Food Science Environmental Scan:**

Besides being the oldest Food Science Department in the U.S. it is also one of the best. In the National Research Council in 2010, the Department S Ranking was 1-2, our R ranking was 1-8 and our research ranking was 1-1. A comparison to other top Food Science Department is shown below:

**NRC Faculty Research and S Rankings for Top Food Science Programs:**



NRC data is supported by Academic Analytics data from 2012 where we were again ranking closely to Cornell.



In the 2012 Academic Analytics Data, UMass Food Science had 3 times more awards, twice as many grants per faculty, 180% more grant \$/faculty, 270% more journal publication/faculty and 510% more citations/faculty than the median values of our peers. Our especially high productivity in research has been recognized by Thomson Reuters naming 3 of our faculty (McClements, Park and Decker) to its most Highly Cited Agricultural Researchers. Dr. Micha Peleg was also recognized as a Highly Cited Agricultural Researchers in the previous ranking. UMass Food Science is the only Food Science Department in the World with 3 faculty members on the currently Highly Cited Agricultural Researchers list.

The Department of Food Science in conjunction with its Advisory Board has also been very successful in its development activities with our total donated funds since 1990 now exceeding \$10 million. These funds support 2 endowed chairs, 4 graduate research assistants, 6 graduate scholarships, 15-20 undergraduate scholarships, student travel to scientific meetings and general research and Departmental support.

Since 1992, the Department has had a Strategic research Alliance with the Food Industry. The Alliance currently consists of 22 dues paying members that include food manufacturing, ingredient and service companies. Each year the Department holds an annual meeting that includes a half day workshop consisting of Hot Topic Updates, Research in the Department and a Student Poster Session. The annual meeting also provides opportunities for members to have one-on-one consulting opportunities with faculty. The Alliance has been instrumental in the success of the Department for numerous reasons as it has formed strong partnerships with food companies that fund research and hire students in addition to the financial support they provide the Department with their annual dues. This financial support is primarily used to support research instrumentation and repair and to pay for new faculty start-up costs.

### **International Recognition**

The international reputation of UMass Food Science has also grown in recent years. This can be seen in a 1.5 fold increase in self-funded visiting scholars in the past 5 years. In addition, self-funded international MS and PhD numbers have increased from 4 in 2009/2010 to 20 in 2013/2014. We have signed international education and research agreements with Kasetsart University of Thailand, University of Hohenheim in Germany and University of Nuevo Leon in Mexico, the top Food Science Programs in their respective countries. We are also developing strong research and education collaborations in China including Jiangnan University, Ocean University of China and the Institute of Agro-products Processing Science and Technology (Chinese Academy of Agricultural Science).

### **Emphasis of Research Expertise**

Food Science is a very broad discipline encompassing field such as engineering, chemistry, microbiology, sensory science, nutrition, quality control, laws and regulations and policy. Many Food Science Departments have tried to hire faculty in as many of these disciplines as possible resulting in not having strength in any areas as many faculty are only 1 deep. We have decided not to take this approach and develop centers for expertise with multiple faculty. We have also carefully chosen our centers of expertise to reflect food industry priorities, government research funding opportunities and areas that can provide opportunities for multidisciplinary team research and teaching. Our centers of expertise include:

- 1. *Physical-Chemical Properties for Food Quality & Function***
- 2. *The Safety of Food***
- 3. *Foods for Health and Wellness***

*Physical-Chemical Properties for Food Quality & Function* and *The Safety of Food* are traditional food science disciplines that are core to our teaching mission and are supported by grants for USDA's

Agricultural and Food Research Institute (AFRI). Grants provide by AFRI are substantial (\$400-500K for 3 years). These areas also funded by commodity agencies (e.g. Dairy Management and Center for Produce Safety). We were one of the first Food Science Departments in the USA to develop expertise in *Foods for Health and Wellness*. This area of expertise was established as it is now a core emphasis of essentially all food companies and thus it was essential to train our students with this expertise. In addition, this also allowed us to expand our research funding base to agencies such as NIH, American Heart Association and American Institute for Cancer research. During our last AQAD review, our outside reviewers were surprised and impress by our emphasis in this area which reflected that we were ahead of the curve in developing this research expertise.

### **Overall Status of the Food Science Department**

The far majority of research indicators show that UMass Food Science Department is one of the best, if not the best, in the US and the world. We have international recognition in all of our areas of expertise and are one the cutting edge of new areas such as foods for health and wellness. Our program is growing in also all areas such as research expenditures, undergrad students, graduate students, fund raising and faculty awards. However, the faculty feel that many members of the food industry are not aware of these the overwhelming statistics showing our excellence. Therefore, we will develop plans to have our students become more involved in national and international scientific meetings and competitions to enhance our reputation.

### **Destination of Choice:**

In the US, Food Science programs traditionally have small undergraduate programs. Our undergraduate program has increased in the past 10 years from 36 to 100. This type of increase has also been observed nationally and is likely due to an increase in interest of food production and a decrease in the economy which attracts students to the excellent salaries and placement potential of food science jobs. Our current enrollment of 100 is similar to the national average of 96. Larger undergraduate programs exist in more traditional agricultural states such as California, Kansas State and Wisconsin. Our current undergraduate body is 40-50% out of state students.

Undergraduates students looking at UMass Food Science should be attached by:

- Departmental ranking in the top 3 of all University Departments in the Student Satisfaction Survey for 8 years in a row
- One year retention of 83%
- Four year time to degree rate of 70%
- Above average cohort of female and ALANA students
- Excellence in advising and career preparation
- Small Food Science classroom size
- High number of faculty recognitions and awards

### **Undergraduate Student Assessment**

The undergraduate degree in food science and technology requires knowledge of the fundamental sciences and all disciplines of Food Science (food chemistry, food microbiology, food processing, sensory evaluation, engineering and health and wellness) and the interconnections between each. Students must demonstrate the ability and skill to: define, analyze and solve in a practical way evolving problems related to food production; apply chemistry, engineering, nutrition and microbiology knowledge to produce a safe and wholesome food supply; communicate effectively both orally and in writing. While students are at UMASS student learning and programmatic satisfaction is assessed by: College of Natural Science Junior Year Survey; Product Development Senior Capstone Course Evaluation by Instructor and Undergraduate Program Committee (FS 563); graduating seniors group and individual exit interviews; feedback from corporations who hire students for summer internships. The undergraduate program committee and department head review data yearly and identify areas needing improvement to faculty to improve curricula based on the assessment. Below are examples of changes in the curriculum as a result of student assessment and food industry feedback.

With the increasing concern for food safety by the consumer, public health community and the food industry, we decided to increase student exposure to addition Food Microbiology. Dr. Levin modified FS 466, The Hygienic Handling of Food, into a course that provides students with fundamental microbiology knowledge and skills with emphasis on how microbiology impacts foods. Due to the large demand for this course, we have added another section of this class which is being taught by Dr. Sela.

In the area of Health and Wellness, we have had several new and revised courses. Dr. Xiao has revised FS 101, Food and Health to focus on how food and food components play a role in nutrition and disease. Dr. Park developed a new course several years ago on nutrition and functional foods entitled Biology of Food in Human Health, FS 270. This course not only covers more advanced issues of nutrition than FS 101 but also how relates how the food industry can develop healthier foods.

To get our first year students more exposure to Food Science, we added an additional food processing class, Introduction for the Future Food Scientist (FS 190I). This class covers the origins of food and how they are processed. Due to the increasing complexity of food ingredients such as flavors, preservatives, colorants, we also added a second food chemistry class (FS 542) taught by Lili He.

We have also added professional development to several of our classes to help students with job placement. This includes resume preparation, interview training and job searches in FS 190I, 265 and 391C. This preparation seems to have been effective as Pepsico remarked very positively on the maturity and quality of our students at recent internship interviews.

### **Future changes in Undergraduate Education**

The statistical ranking of Food Science Department's consistently shows UMass at the top. However, when we informally pool representatives of the food industry many people do not realize our top ranking. This is likely due to the lack of access of the ranking data to the food industry, a problem that is not likely to be solved in the near future. Since this lack of recognition could impact our ability to attract student placement in interns and jobs and could also prevent companies from coming to UMass for our

Strategic Research Alliance and research funding, we propose an additional approach to increasing the visibility of the strength of the Department would be to become more visible at National meetings.

One of the main job markets for our students is in the area of product development. Several commodity organizations and our professional society, the Institute of Food Technologists, have product development competitions. These competitions are nationally prestigious and also prepare the students for the job market. We propose to develop a 1 credit product development course that will be taught each semester that would be required for all students interested in participating in the national product development course. This course would teach the fundamentals of product development, marketing and food regulations such as labeling and would help to student prepare for the competition. An additional advantage of this course is that it would increase student contact with faculty thus increasing our faculty accessibility statistics.

We would also develop a similar 1 credit undergraduate research methods course that will be taught each semester for students that participate in undergraduate research projects. This course would cover topics such as literature searches, understanding scientific papers, scientific writing and experimental design. Students in this course would then be encouraged to enter undergraduate research competitions. This course should help increase the productivity of undergraduate research, increase student accessibility to faculty and improve our national research stature. The instructor of this course will also track graduate research competitions and help grad student submit their applications.

### **Undergraduate Recruitment**

Recruiting undergraduate students has been an important activity in the Department for over 25 years. These efforts have been very successful and we are looking to continue to grow our undergraduate student numbers. At every opportunity, the Department participates in recruiting activities on- and off-campus. The department has used a multi-faceted approach to advertising our major on campus with the intent of increasing our undergraduate population, including placing table tents in dormitory dining tables, placing color posters in dorms, distributing a Food Science newsletter developed for recruiting purposes outside large classrooms, such as Biology, Chemistry, and Physics during the registration period, departmental display boards, advertisements in the Student Newspaper and Facebook, and on campus buses. One of the best recruiting tools has been recruiting by our own undergraduate students. Each semester, we select 2-4 undergraduate students, sophomores to seniors, to participate in a number of the Campus events described above. In addition, two Commonwealth College Honors Seminar series and one Freshman Seminar course have been offered for all majors as an additional venue to educate students about Food Science since the Fall of 2009. This summer, Dr. Park participated in a Summer College course for undergraduate research which will also increase student exposure to Food Science. In addition, the department teaches four University service courses, which exposes our major to a large number of students. Off-campus activities include participating in University- wide high school student recruiting events (such as the Autumn Event), presenting and demonstrating to high school students with an interest in science at UMass Science Days, 4-H events and the Eureka Scholars program, participating as research advisors as well as judges at the Western Massachusetts Regional Science Fair, and offering departmental tours to visiting high school students and their parents.