The second semester of another busy year is
getting underway as this is written. When
school began in late August and registration
was complete, we found that we had the largest
number of graduate students ever enrolled (66)
in the department, a small increase in B.S.-
degree students (44), and a small decrease in
students enrolled in the two-year Ag Institute
Program (11). The increased enrollment of grad-
uate students is due in large part to the two
research centers now in operation in the de-
partment [the Center for Aseptic Processing
and Packaging Studies (CAPPS) and the South-
east Dairy Foods Research Center (SDFRC)] and
to the four USDA National Needs Fellows who
enrolled last January. Good news received dur-
ing the year was that we were awarded three
new USDA National Needs Ph.D. Fellowships in
national competition. [Related article on page
2.]

The small increase in enrollment in the B.S.
program is a welcome sign and one which we
hope continues. The decreased enrollment in
the two-year program is a cause for concern be-
cause of the demand for graduates and because
courses cannot be offered if under-enrolled.
This will be an area for increased attention in
recruiting. We are again actively involved in
programs to increase the enrollments in the
undergraduate programs and to continue to
compete for the top students nationally who are
entering graduate study in food science.

I wish that we could attribute the increased
enrollment in two of the areas to an altered
image of food science and agriculture. Unfor-
lunately, this is not so. This is an area which still
causes us much concern. Too many think of
agriculture in terms of production farming and
of food science in terms of home economics or
food service. The Institute of Food Technol-
gists is concerned about the image problem; it
also affects research funding for the important
value-added (postharvest) sector of our nation's
economy. This is a challenge to each of us and to
you. How do we communicate to colleagues and
to young people considering their future the
excitement, rewards and scientific challenges
available in a career in food science? It will take
the combined efforts of all of us, working with
high school science teachers, advisors, stu-
dents, colleagues and legislators, if the desired
change in image is to occur. Will you help? Pre-
sentations to groups (high school classes, clubs,
civic groups), discussions with colleagues and
young people investigating career opportuni-
ties, and sending information (which can be
obtained from us) about programs in food sci-
ence to individuals planning to attend college
are all components of initiating changes in
image and recruiting more students into food
science.

In spite of mergers, leveraged buy-outs, and
"down-sizing", employment opportunities con-
tinue strong for all of our graduates. We hope
that this will continue and, at this time, do not
have reason to believe that it will not. What
trends do you see in the industry and its needs
for food science graduates? Let us hear from
you?

As our students begin to make summer plans,
we strongly encourage as many as possible to
locate intern positions. We find that a summer
internship is a great experience for students
and has significant career impacts in terms of
future aspirations and courses selected. If you
have opportunities for one or more interns in
your organization, please let us know. We hope
and believe that it is a mutually beneficial ex-
pense.

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NCSU Students Cited for Presentations and Awards

The October issue of Food Technology noted four NCSU students or alumni winning recognition in IFT activities. Dennis Romero won First Place in the 1989 IFT Biotechnology Division Graduate Student Paper Competition for his paper entitled "Characterization of an Insertion Sequence from Plasmid pTR280 and Its Role In the Expression and Dissemination of Phage Resistance in Lactococcus". Linda Harris won Second Place in the Z. John Ordal Graduate Student Paper Competition sponsored by the IFT Food Microbiology Division for her paper, "Sensitivity and Resistance of Listeria monocytogenes to Nisin." Michael Chesson placed fourth in the 1989 IFT Undergraduate Research Paper Competition for his paper, "Use of Bacterial Starter Cultures in Boneless Country Hams." Recent Graduate Jose Gerardo Montejano-Gaitan was awarded the 1989 National Award in Food Science Research - Mexico. This $5,000 (U.S.) award was sponsored by Coca Cola Co. of Mexico. Also, the first Donald Withcombe Graduate Fellowship in Food Chemistry was awarded to Sharon X. Chen by the Agricultural and Food Chemistry Division of the American Chemical Society. This one time $25,000 award honors a beginning graduate student with outstanding grade point averages and promise of an excellent research career, as determined by letters of recommendation and the project proposal.

Scholarships and Degrees Awarded (V.A. Jones)

Scholarships have been awarded to 18 Food Science students for 1989-90. Recipients pursuing a B.S. degree include Terry Caviness (Lakeview), Vanessa Daniels (Castalia), Ginger Goodman (Sallisbury), Suzanne Hauthecock (Cary), Martha McLean (Wagram), Kerri Moreno (Greenville), Jaime Mullerat (Raleigh), Angela Peterson (Goldsboro), John Roberts (Newton), Lisa Shaw (Raleigh), Reem Sidahmed (Durham), Debra Smith (Raleigh), Carol Tompkins (Springfield, VA), Laura Willson (Matthews), and Christy Wilson (Clinton).

Students in the two-year Food Processing Distribution and Service Curriculum awarded scholarships include Andrea Bradshaw (Raleigh), Jonathan Morgan (Rockwell) and Fred Rieken (Siler City).

Food Science scholarships are provided by the N.C. Dairy Products Association, the N.C. Meat Processors Association, Stouffer Foods, the Tarheel Supplyman's Association and the following endowments: Harry L. and Kathleen Barnes, Benjamin Wesley Kilgore, Mose and Helen Kiser, J. Frank and Margaret Neely, and Hase H. and Lena Male Smith. Three of the B.S. candidates also won scholarships in national competition. Carol Tompkins won both a RJR Nabisco Scholarship and an IFT Freshman Scholarship. John Roberts received an IFT Scholarship and Ginger Goodman a National Dairy Promotion and Research Board Scholarship. In addition, at least two Food Science majors are recipients of athletic scholarships: Charmaine Hooper in Soccer and Marco Meu- link in Track.

Ten students associated with the Department of Food Science completed degrees in August and December. M.S. degrees were awarded to: Ann Caugherty-O'Neil (Vandergrift, PA), Julia Ellen Erickson (Corvallis, OR), and Jeff Wayne Liebrecht (Delphos, OH). Students awarded Ph.D. degrees were Paul Lee Dawson (Salisbury, MD), David Patrick Green (Durham), Hae Dong Jang (Seoul, Korea), Yuan-Hae Tay Shyu (Taiwan), Wesley Davis Sing (Indianapolis, IN), Wayne Carl Thresher (Big Flats, NY). One student, Martha Davis Alexander (Henderson), completed the associate degree program.

More USDA National Needs Fellowships Awarded

A faculty committee consisting of P. M. Foe- geding, R. McFeeters, (co-principal investigators), S. Schwartz and L. Boyd submitted a proposal to the USDA last spring for funding of National Needs Fellowships in the Food Science Department. The NCSU proposal was rated number one of all those submitted and was awarded funding for three Ph.D. students to begin in 1990. The awards include stipends at nationally competitive levels and an additional amount for research expenses and travel to scientific meetings. A recruitment effort to locate high caliber applicants is currently underway.

This is the second consecutive year that USDA National Needs Fellowships were awarded to this department. Four students who began their doctoral studies during 1989 under this program are working in the areas of microbiology, protein biochemistry, protein functionality and engineering. The group has organized a journal clubs to discuss interdisciplinary topics in food science.

Evening Course in Food Microbiology

Food Microbiology [FRMB 405] for the first time will be offered in the late-afternoon/early evening in the fall semester (Aug. 22 to Dec. 7, 1990). The course will cover environmental factors which affect microbial growth, preservation principles used to control unwanted organ-
Extension Highlight

(D.R. Ward and R.E. Carawan)

Water Conservation and Waste Reduction in Food Processing

Everyone is dependent upon water for health and well-being. The fact that our water supplies are sometimes contaminated and frequently perceived to be in constant jeopardy by chemicals from agriculture, septic systems, publicly owned treatment plants and industry (including the food industries) has led to the passage of numerous laws and regulations and even the creation of the United States Environmental Protection Agency. Many food processing plants use large quantities of water, some as much as 10 million gallons per day. The water used for washing products, blanching, making syrups, and cooling conveyors, one cleaning, and sanitation must be properly treated to prevent it from becoming a source of pollution.

The importance of improved water conservation and waste reduction practices in food processing plants created the need for a focused programming effort in this area. All of our extension faculty have been involved as well as a number of researchers, but the leadership for the program has been provided by Dr. Roy Carawan, Professor and Extension Specialist.

A significant part of Dr. Carawan’s program has been Challenge Grants from the North Carolina Pollution Prevention Program. Ten North Carolina food processors have received eleven grants which have focused on water conservation and waste reduction. These projects have included a variety of food plants including dairy, poultry, seafood, yeast and snack food bakeries. Project management teams have included Carawan with the assistance of Drs. Rushing, Tarver, Pilkinson, Green, Thomas, and Sheldon.

Project reports, slide-tape sets, computer programs, fact sheets and other educational materials have been prepared for use by food processing plants. The fact sheets, which now number eleven, are available for the poultry, dairy and seafood industries. A list is attached for your convenience. Other materials are available on request.

The focus of our extension effort has been the “Pollution Prevention Pays” concept. This concept emphasizes that the conservation approach should be used to eliminate the causes of pollution before spending money and resources on treatment. These efforts have helped make government, industry, and the public aware of the shortcomings of conventional pollution controls, not to mention their costs. One N.C. dairy is now recovering more than $300,000 per year worth of product that was going down the drain, a breeder plant is selling more than 100,000 pounds per week of breeding materials which were going down the drain; and a yeast plant is saving over $200,000 per year. These examples give meaning to the slogan “Bank or Drain”, which has been adopted by our extension program to emphasize the importance of this work.

The significance of Dr. Carawan’s work is evidenced by invitations he receives for presentations. Papers have been requested for the Food Processing Waste Conference; the American Bakers Association; the Environmental and Energy Engineering in the Food Industry Conference; Clean Water Act Compliance Course; The Clean Water Act and the Poultry Industries; Louisiana Seafood Equipment and Marketing Exposition; Processed Apple Institute; National Poultry Waste Management Symposium; and the Annual Meeting of the North Carolina Poultry Federation. Presentations planned for 1990 include the South Carolina Food Processors Association, Texas Food Processors Association and the Mississippi Conference on Waste Reduction in the Food Industries.

Many of you may not have been aware of the scope of the food industry’s pollution concerns. Furthermore, you may not have been aware of our department’s activities in the area of water conservation and waste reduction. We are one of the few departments in the nation to address these issues. We are justifiably proud of the program and feel it can serve as the basis for a national program or center, to further advance solutions to these issues.

For More Information

If you’re interested in more information on how you can save money by conserving water and reducing waste discharges, ask for copies of the following publications, and others on related topics, from your county Agricultural Extension Service office; or contact Department of Food Science, Extension, North Carolina State University, Campus Box 7624, Raleigh, NC 27695-7624. These publications and other information are also available from the North Carolina Pollution Prevention Program (919-733-7035).

CD-20, Liquid Assets for Your Poultry Plant
CD-21, Liquid Assets for Your Dairy Plant
CD-22, Poultry Processors: You Can Reduce Waste Load and Cut Sewer Surcharges
CD-23, Survey Shows That Poultry Processors Can Save Money by Conserving Water
CD-24, Poultry CEOs: You May Have a $60 Million Opportunity
CD-25, Preventing Pollution in Shrimp Processing
CD-26, Cut Waste to Reduce Surcharges for Your Dairy Plant
CD-27, Systems for Recycling Water in Poultry Processing
CD-28, Water and Wastewater Management in a Dairy Processing Plant
CD-29, Dairy CEOs: Do You Have a $800 Million Opportunity?
CD-30, Pollution Prevention Pays in Food Processing
Centers

CAPPs NEWS
(K.R. Swartzel)

The Food and Drug Administration and Fluor Daniel became the newest members of the Center for Aseptic Processing and Packaging Studies on October 1. Tom Ernst, IAB representative from Ralston Purina Company, stated, "We feel that FDA participation in CAPPs will enhance growth potential and long term viability for the organization."

Fluor Daniel, a totally vertically integrated architectural, engineering, procurement, construction, and maintenance firm, offers services from concept to start-up and on-going operation to their clients throughout the world. They are active on six continents with 50 offices that have executed projects in over 100 countries.

With these new members, CAPPs membership strikes a balance between the academic, regulatory, packaging, consumer product and biotechnology sectors that will insure the success of this industry/university cooperative effort. After two years of operation, CAPPs has twelve projects funded, involving faculty, students and technical support in several departments of NCSU and two other major universities. Several new pieces of equipment have been added to the pilot plant here, and industry contract runs are at an all-time high. The certification aseptic school has been at capacity for both years.

The state-of-the-center is good. Top management of several major food companies are evaluating internal recommendations to join CAPPs during the next year. All associated with CAPPs are congratulated for a great job.

Aspects of processing that enhance the safety of dairy products was emphasized in Peggy Foegeding's discussion of dairy microbiology research. John Rushing explained the role of extension in training dairy plant personnel to ensure safety in dairy foods. Future training activities are likely to take the form of demonstration programs in plants, cooperative education between companies and the Food Science Department, and modular, competency-based instruction. The audience, consisting mostly of dairy producers, was appreciative of the research being done in the dairy foods area. Much of this work is supported by the Southeast Dairy Foods Research Center.

Faculty Notes

Dairy Overview
(J.C. Allen)

The College of Agriculture and Life Sciences sponsored a Dairy Overview on November 7, 1989, at the McKimson Center. Faculty in the College involved with Dairy Research and Extension summarized and discussed present and future activities with selected members of the North Carolina dairy industry. Activities in the Food Science Department were presented by Drs. Don Ward, Todd Klaenhammer, Allen Foegeding and Peggy Foegeding in a session on Milk Quality and Processing. Klaenhammer pointed out that the image of dairy processing relates to traditional products, but that current and future research is in less visible areas of aseptic packaging and processing, detection of hazardous materials, and converting milk into ingredients for dairy-based and other types of foods. The functional properties of milk components that permit them to be processed into new products were explained by Allen Foegeding. Utilization of milk for other than traditional dairy products is likely to be a key factor for increasing demand and remaining competitive in the global market.

Faculty Recognized for Patents
(Joanne Giles)

Five of the 37 North Carolina State University inventors who received plaques at an Inventors' Awards Luncheon are members of the Depart-
ment of Food Science faculty. The plaques were presented to NCSU inventors receiving Letters Patents since 1978 in recognition of outstanding achievement. Dr. Franklin D. Hart, Vice Chancellor for Research, made the presentations at a luncheon held December 7, 1989 at the NCSU Faculty Club. The Office of Technology Administration hopes to make this an annual event.

Inventors in the Department of Food Science received approximately 22 percent of the plaques awarded. This demonstrates the quality of research being conducted in our department. Dr. Harold E. Swaisgood was the recipient of three plaques representing patents concerning the immobilization and use of enzymes and proteins.

The other patents spanned a broad spectrum of research areas. Drs. Ball and Swartzel received a patent for their work in ultrapasteurization of liquid whole egg products. Dr. Hassam's patent was entitled "Vacuum Seal Plants." Dr. Lanier received his patent for work in retarding denaturation of meat products. Dr. Speck, an emeritus professor, received a patent for his work with heat resistant bacterial proteases in ultra-high-temperature milk.

We congratulate these professors for a job well done!

Faculty Activities

The faculty reported participation in a variety of research and academic activities this fall. Jonathan Allen wrote and received approval for a new Experiment Station Project, "Transport and Partitioning of Zinc Between Free and Bound States in Milk and Mammary Epithelial Cells", and received a grant from the NCSU Faculty Research and Professional Development Fund for a similar project. He and Arlene Klapes, with about 20 other new faculty members and deans from the College of Agriculture and Life Sciences, participated in a two-day tour of agricultural production and processing facilities throughout eastern North Carolina. Dan Carroll was appointed to a 5-year term as Adjunct Assistant Professor of Nutrition, School of Public Health, UNC at Chapel Hill, where he has been teaching NUTR 103 to graduate students and advanced undergraduates. He was recently appointed Chairman of the Scholarship Committee for the American Society for Enology and Viticulture - Eastern section. E. Allen Foegeding presented a talk entitled "Gelation of Myofibrillar Protein" at the 1989 International Chemical Congress of Pacific Basin Societies in Honolulu, Hawaii. Peggy Foegeding presented an invited paper entitled "Calcium in Bacterial Spores - An Old Subject Revisited with a New Look toward Calcium
Binding Proteins" at the XII Food Microbiology Research Conference, Chicago, in November, P.M. Foegeding and N.A. Klapes received funding from CAPPS for a new project, "Recovery of Hydrogen Peroxide-Treated B. subtilis var. Globigii" spores. Max Gregory has returned from a 6-month study leave at Appalachian State University, where he developed and taught a course in food safety and sanitation. Arthur Hansen attended the Dairy and Food Exposition in Chicago in November. He has recently received three grants: "Functional Properties and Sensory Qualities of Cellulose Gel in Low Fat and Fat-Free Frozen Dairy Products," $38,865 funded by FMC Corp., "The Effect of Nitrogen Sources on the Flavor of UHT Milk," from Dairyland Foods, $92,500, and "The Effect of UHT Processing, Packaging Materials, Ingredients, Flavors, Oxygen and Storage on the Flavor Stability of UHT Products," $98,290 from CAPPS. Dr. Hansen continues his work on flavor loss in frozen dairy desserts and from UHT packaging systems.

Hosni M. Hassan received a three-year, $240,000 grant from NSF to study "Regulation of Manganese-Containing Superoxide Dismutase in Escherichia coli: Isolation and Characterization of the Repressor Protein." He was invited to participate in a symposium on "Free Radicals in Biomedicine" to be held in Madrid, Spain, February 20-27, 1990. Dr. Hassan will be hosting a visit to the department by Professor Daniele Tousati from the Jacques Monod Institute, University of Paris, France during the week of January 32-39.

Todd R. Klaenhammer presented 2 talks this fall, one at the 26th Marschall Invitational Italian Cheese Conference and the second at the Northern California Branch Meeting of the American Society for Microbiology. He was appointed as an IFT Scientific Lecturer and as an ASM Foundation Lecturer for 1989-90. N. Arlene Klapes attended the American Society of Microbiology Workshop on Newly Emerging Foodborne Pathogens" held in Minneapolis in October. Ty Le Lanier presented invited papers in two separate symposiums at the Pacific Chem Meeting in Hawaii December 18-22. He continued his work with two new Sea Grant projects for 1990-91 totaling about $230,000 over a two-year period. A recent exciting discovery in his lab, that α2-macroglobulin, a protein found in blood plasma and egg-white, can inhibit protein-degrading enzymes in fish, has led to two corporate research contracts to further explore applications for the inhibitor. Dr. Lanier's group is assisting the UNC Sea Grant to prepare a U.S. standard testing manual for assessment of surimi quality based on testing methods developed jointly with Dr. Hamann. Dr. Lanier is collaborating with several researchers in New Zealand; two New Zealand researchers have visited the Department this year, and a third has joined the group for a Ph.D. degree program. Dr. Ed Kolbe, of Oregon State University, is spending the year in this Department on study leave, working with Drs. Lanier, Hamann and Swartzel. "Lineback" presented an invited paper, "An Overview of Starch Granule Structure," at the Carbohydrate Division Symposium at the American Association of Cereal Chemists (AACC) annual meeting in Washington, D.C., November 1989. In December, he chaired the review team for the CSRS Comprehensive Review of the Department of Food Science, Purdue University, and was a faculty member and course director for an AACC short course, "Starch: Structure, Properties and Functionality in Food Systems," in Chicago. He was re-elected to a second three-year term on the Board of Trustees, the Food Processors Institute, National Food Processors Association for 1990-1993. Adjunct Professor Harold E. Pattee was given the 1989 Fellow Award by the Agricultural and Food Chemistry Division of the American Chemical Society in recognition of outstanding research and scientific contributions to the field of agricultural and food chemistry.

Dwain Pilkinson was an official judge of the American Cured Meat Championship held during the 50th Anniversary Meeting of the American Association of Meat Processors in Des Moines, IA, and was invited to judge the Country Ham Show at the Kentucky State Fair. He was selected by N.C. State Fair to be the superintendent of the Country Ham Show and contest, which was the first one held in 27 years. Entries in this event represented both commercial processors and home-cured products. The National Country Ham Cureers group requested that Pilkinson organize and conduct their meeting at the biannual American Meat Institute Convention in Chicago. He assisted Michael Chesson with an entry in the IFT undergraduate paper competition that won the regional contest and placed fourth at the National level.

Steve Schwartz has developed a new course on Food Toxicology, and received a new $10,000 grant from the N.C. Biotechnology Center for "Extractive Fractionation of Beta-Carotene from Dunaliella Algae by Supercritical Fluids." Brian Sheldon has a new $10,000 grant for "Efficacy of Hydrogen Peroxide Disinfection in Poultry Hatcheries, Phase II," funded by the Degussa Corp., and a new Experiment Station Project, "Efficacy of Bacteriocins in Controlling Poultry Food-Borne Pathogens and Spoilage Microorganisms" approved. During the November 6-8, 1989, Food Processing Waste, Conference in Atlanta, he made a research presentation entitled "Water Use and Wastewater Discharge Patterns in a Turkey Processing Plant."

John Rushing recently gave the keynote address at the annual Iredell County Farm-City Week dinner, sponsored by the Statesville and City of Progress Kiwanis Clubs and the Iredell County Agricultural Extension Service. The Statesville Record deadline reporting on his address on "Food Residues - A Science/Media Conflict" read, "U.S. Food Supply Called Wholesale, Abundant." Fred Tarver retired October 1 after a long career in poultry products extension. Over 100 people gathered to wish him farewell with a reception in the Department and a dinner at the Plaza Hotel. William M. Walter, Jr., presented a paper entitled "Effect of Water Stress on Stored Cucumber Fruit," at the 1989 Fall National American Chemical Society Meeting in Miami, FL, last September.
Alumni News

A few reports of whereabouts and happenings of some of our alumni have filtered through to our editorial office. After graduating from Oregon State University in 1985, Marilyn Erickson (B.S. 1978) went to the University of Massachusetts Marine Station in Gloucester, MA, as a postdoctoral research associate. In October, 1987, she accepted a position at the University of Georgia as an assistant professor in the Department of Food Science and Technology at the University of Georgia Agricultural Experiment Station in Griffin. Her research program focuses on mechanisms and measurement of oxidative deterioration in seafood; removal of environmental off-flavors from aquaculture products; and sensory properties of fish as affected by diet.

M.S. student M. Fulp moved from Ross Laboratories to International Paper. M.S. student Paul Pineda, after working for Kellogg’s International in Venezuela for 3 years, is back in the U.S., learning all phases of production at Kellogg’s plant in Nebraska. He recently married and his wife is also in Nebraska. M.S. student Susan Leasor is working at Difco in Michigan. Ph.D. student Yuantay Shyu is doing a post-doc in the Biochemistry and Biophysics Department of the University of California, Davis. Dr. Wes Sing completed his Ph.D. degree in October, and has rejoined his family’s company, Vivolar Cultures, Indianapolis, Indiana. Melissa Joerger joined Dupont as a Research Scientist in November. Dr. John Luchansky, a post-doctoral researcher in Dr. Klaenhammer’s lab for the past 2.5 years, joined the faculty at the University of Wisconsin, Food Research Institute, starting December 4, 1989.

Paul Dawson received his Ph.D. last spring and is now working in the Department on a CAPPs project. Paul was the winner of his division and the first North Carolina resident to finish the Raleigh Old Reliable 10 km Road Race in October.

Is Your Name missing from this list? Want to have it included? Send us information about yourself: personal items, marriages, new children, divorces, hobbies; professional items, job titles, promotions, new companies, awards. Tell us about your classmates and other NCSU Food Science Alumni! Fill out the form below and mail to:

Jonathan C. Allen
Editor, Food Science News
236 Schaub Hall, Box 7624
North Carolina State University
Raleigh, NC 27695-7624

Evening Course Available (continued from page 2)

isms, metabolic capabilities of spoilage organisms and organisms used in ferments, foodborne pathogens and methods used to detect organisms or their endproducts in foods. This 3-credit, senior-level course has general microbiology as a prerequisite (MB401 or equivalent). It will be taught by Dr. Peggy Foegeding. The lecture will be held from 8:40 to 5:35 p.m. on Wednesday and one lab/problem section will be on Monday from 8:40 to 6:35 p.m. The Department has received requests for evening courses. We are hopeful that this time slot will make it possible for persons employed in industry to enroll in Food Microbiology.

Name:
Degree(s), year(s):
Address:
City, State, Zip:
Employer/Company Name and Address:

Other News: