

NC STATE
UNIVERSITY



TABLE OF CONTENTS

- 2 Letter from Department Head
- 4 Synonymous with Seafood
Dr. David Green – champion of the North Carolina seafood industry
- 10 Food Safety – in Virtual Reality
Virtual representations of real-world food manufacturing facilities
- 14 Cracking the CRISPR Code
A cut-and-replace gene-editing system taking the scientific world by storm
- 18 FBNS in the News
Swartzel Elected to National Academy of Engineering
- 19 The Science of Low and Slow
A Lasting Legacy
- 20 Department Notes
Faculty and Staff Awards and Honors
- 21 Student Awards and Honors
- 22 Partners and Donors

EVENTS

2016

- Novemberfest Nov 22
- FBNS Fall Graduation Dec 16
- Holiday Lunch/Open House Dec 22

2017

- Wine and Cheese Mar 25
- End-of-Year Cookout April 25
- Awards Banquet April 27
- FBNS Spring Graduation May 13
- Faculty Retreat May 18
- IFT 2017 Las Vegas June 25-28

Learn more at go.ncsu.edu/fbns

ALL-ENCOMPASSING. ALWAYS.

“Murphy to Manteo” is a common phrase that North Carolinians use to describe the breadth of our great state. Like North Carolina itself, our department also is a comprehensive system striving to educate stakeholders through impactful programs.

For starters, we serve the seafood industry through the Center for Marine Sciences and Technology in Morehead City. In Kannapolis, FBNS faculty at the Plants for Human Health Institute investigate the benefits of plant-based diets. And within our beloved Schaub Hall, the department is home to centers, collaboratives and acclaimed faculty developing strategies to promote science applied to food.

Our department also is home to two USDA research units that serve the sweet potato, peanut and cucumber commodities. And our Extension faculty are on the ground helping aspiring food business owners create and launch exciting new food products.

With three allied and vibrant undergraduate degrees and a prolific graduate program, our students contribute to a breadth of industries, from food and pharmaceuticals to allied health and nutrition.

In addition to more than 550 enrolled students and more than 100 faculty and staff, the department also oversees 275 dairy cows and the legendary Howling Cow Creamery as part of our dairy enterprise system.

And, of course, the FBNS Department wouldn't thrive without you, our alumni and friends. Thank you for all you do to help us serve Murphy to Manteo and beyond.



Christopher R. Daubert
Department Head

Our Future is Bright

FBNS students Andy Lee, Emily Stout and Jeff Hymes took first place – and \$8,000 – at the 2016 National Dairy Council New Product Competition for “Panikotta,” their multi-compartment Greek yogurt and cultured non-fat dry milk product with 10 grams of protein.





SYNONYMOUS WITH SEAFOOD

Ask most anyone involved in North Carolina's seafood industry if they've crossed paths with Dr. David Green, and chances are the answer is yes.

Green wears a number of hats – director of the NC State Seafood Laboratory, founder and former director of the Center for Marine Sciences and Technology (CMAST), professor of food science, department Extension leader – but the most important one is a title you won't see listed on his CV: Champion of the North Carolina seafood industry.

"For the last 30 years, Dr. Green has selflessly devoted his career to helping the seafood industries of North Carolina and beyond," said Dr. Chris Daubert, FBNS department head. "He has staked a career on adding value to fish and fishery products through research, education and training support for industry in value-added product innovation and branding techniques. He is an exceptional faculty member, and his programs have had a significant impact on the state's seafood and food manufacturing industries."

In fact, Green is known worldwide for his innovative outreach programs and for bringing recognition to food science. He has won a number of awards, including a recent Lifetime Achievement Award from the Atlantic Fisheries Technology Conference and Seafood Science and Technology Society of the Americas. He has served as chair of the IFT Aquatic Food Products Division, editor-in-chief of the *Journal of Aquatic Food Product Technology*, and is a long-time member of the steering committee of the National Seafood HACCP Alliance for Education and Training.

Green also helped establish the Marine Science and Education Partnership, a ten-member institutional partnership that was shown in 2004 to be directly responsible for over 3,000 jobs and \$127 million to the local economy.

As he prepares to retire, Green reflects on the last three decades and looks ahead to the future of North Carolina's seafood industry.

Small Fish, Big Impact

Dr. David Green's work as director of the NC State Seafood Laboratory and CMAST has had a significant impact on the state's seafood industry over the last 30 years.



You've served as director of the Seafood Lab since 1986. What would you say are your biggest accomplishments during that time?

By far, the greatest organizational achievement was establishing the NC State University Center of Marine Sciences and Technology (CMAST) in Morehead City. CMAST gave NC State a footprint on the coast that enabled campus-based faculty, professional staff and students to have a base of operations for conducting field investigations and delivering coursework not previously available to them.

CMAST also helped forge stronger partnerships with stakeholders and other marine science and education institutions such as the UNC Institute of Marine Science, Duke University Marine Laboratory, NOAA National Marine Fisheries Laboratory, the N.C. Community College system and multiple state agencies including the N.C. Division of Marine Fisheries, N.C. Shellfish Sanitation and Recreational Water Quality Section, and N.C. Department of Agriculture and Consumer Sciences.

I think my biggest professional accomplishment was creating a tenure-track faculty position with two professional staff positions at the Seafood Lab in Morehead City.

This accomplishment was made possible only through the efforts of stakeholder groups, including the North Carolina commercial seafood industry and state agencies, who recognized the value of education and training programs, technical services and applied research. Support provided by the N.C. General Assembly for the Seafood Lab established the foundation on which later professional accomplishments were made possible.

You were instrumental in getting the CMAST facility built and served as its first director. What was it like getting such a big venture off the ground?

Dr. Frank Bancroft Thomas was the first seafood Extension specialist in the department. He was responsible for establishing the Seafood Laboratory beginning in the early 1960s. Dr. Thomas wanted to put food science expertise in the hands of those who

needed it most – members of the seafood industry in coastal North Carolina. He, along with graduate advisor Dr. Tyre C. Lanier, were my mentors, colleagues and life-long friends. They gave me the self-confidence to launch CMAST.

The experience was unsurpassed in anything I had done before, and the skills acquired have served in other endeavors throughout my career. Whenever I was in doubt about an important decision, Dr. Thomas would say, "You've studied your entire life for this opportunity – just go and do it." I used this approach often over the years to move the bar higher and farther than ever before.

How do you think the work of the Seafood Lab and CMAST helped grow the state's seafood industry?

I believe the work that has most helped the state's seafood industry has been delivery of education and training workshops on the United States Food and Drug Administration Seafood Hazard Analysis and Critical Control Point (HACCP) regulation.

The Seafood Lab offers three courses annually and participants receive certificates from the Association of Food and Drug

Officials. The Seafood Lab also conducts process validations and verification to ensure product safety as part of a firm's HACCP plan. Validation studies are required whenever there is a significant change in processing equipment, packaging or product formation that may affect

food safety. Without the training and validation services, commercial seafood dealers and processors would not be able to sell their products in the market.

The state's seafood industry has also benefited from applied research and demonstration projects like cryogenic freezing techniques to improve quality, stress reduction at harvest to extend fresh fish shelf-life and value-added processing for crabmeat pasteurization, smoked fish and trout caviar. The most significant value-added product resulting from joint research and Extension efforts was development of scallop medallions by Wanchese Fish Company. This value-added product is credited with revolutionizing the United States sea scallop industry.

You've studied your entire life for this opportunity – just go and do it.



One of the hallmarks of your career is service on a number of state, national and international project teams. What does this work mean to you?

No one person can do everything, especially in addressing problems that require a multi-disciplinary approach. Working cooperatively on project teams means listening, learning and recognizing others who have the same professional goals and desire to solve complex issues.

The opportunity to participate on a number of state and national project teams has broadened my perspective and increased my program visibility more than was possible before. It raised the bar such that others seek out your input and review of their programs. This in turn provided a wealth of knowledge and innovative ways for addressing local issues in my own programs.

The old adage “think globally, act locally” still applies today. The best approach to do this is to engage in project teams that require multi-disciplinary expertise to address the complicated issues of today. A case in point was establishment of the Trans-Atlantic Fisheries Technology Conference, a joint meeting of three regional associations that meets every third year rotating between North American and Europe. The networking opportunities and resulting personal relationships on an international basis have been invaluable to the development of my state Extension program.

The old adage ‘think globally, act locally’ still applies today.

You’ve been involved in Extension for most of your career, capping it off as department Extension leader, and you’ve also been very active in a number of industry associations. Why is Extension so important to you?

Extension is important because it “puts knowledge to work.” We often hear about a new discovery or an important study, but the real measure of success is applying that knowledge in a way that benefits society. Cooperative Extension was founded within the land-grant system on the premise of extending research-based knowledge to stakeholder groups.

Being an active member of a number of state and national Extension and industry associations has been invaluable. It’s

allowed me to learn from the success of other specialists and associates. It’s given me the opportunity to recognize the contributions of others. And it has provided the opportunity to develop the personal relationships necessary to address stakeholder needs.

The key to success in any program is based on networking, and Extension provides education and training opportunities for those individuals who want to succeed in their programs no matter what subject matter or issue of importance.

What do you think lies ahead for the North Carolina seafood industry?

The needs of the seafood industry have changed over the past 30 years, but in some ways they have not changed at all. When I first expressed a desire to work in the seafood industry, I was told to go back to school and get as much education as possible and then return to help the industry. What I have learned over the years is that knowledge alone is not sufficient to address the issues facing industry and impact positive changes. Solutions must take into account social, economic and political considerations as well.

The second important realization is that the industry is made up of many small family businesses. Dr. Lanier once told me that “being a small fish in a big pond is better than being a big fish in a small pond.” What I would like to see happen in the future is for the North Carolina seafood industry to realize it must adopt technological change more readily and recognize that their future depends upon working together as ‘small fish’ to compete with the ‘big fish’ in today’s world market.

Jerry Schill, president of the N.C. Fisheries Association, compared Green to Mother Teresa for his selfless commitment to others, saying he was “alike in your ability to take the time out of a hectic schedule and write a note of thanks or appreciation to many folks.” North Carolina’s commercial fishing families owe David a note of thanks for his 30-plus years of service to the state’s seafood and food manufacturing industries, Seafood Lab, CMAST, NC State University and State of North Carolina.



FOOD SAFETY – IN VIRTUAL REALITY

In the wake of food safety scares at big-box sellers like Chipotle and Trader Joe's, NC State University food scientists are harnessing the power of virtual reality to keep contaminants off your dinner plate.

NC State food science researcher Clint Stevenson and his team have developed full-immersion virtual reality training sessions that allow students and professionals to interact with virtual representations of real-world food manufacturing facilities, scouting for safety violations.

“We can bring the factory itself inside the classroom, which is amazing,” said Stevenson, an assistant professor and distance education coordinator in the Department of Food, Bioprocessing and Nutrition Sciences. “It creates that ‘Aha!’ moment for students as they experience what it’s like to be there – not just sitting in a classroom listening to technical jargon.”

Pop on a virtual reality headset (any commercially available brand will do), and you’ll find yourself standing in the middle of a bustling seafood restaurant or the factory that makes Howling Cow ice cream. Look up, look down, turn around – the environment developed by Stevenson and his team is a 360-degree experience.

The virtual reality recordings were all made on-site at active businesses; food safety risks like microbial contamination or pests can be digitally staged.

‘Aha’ Moment

Virtual reality training sessions developed by NC State food science researcher Clint Stevenson and his team bring the factory into the classroom, creating a full-immersion experience.



“Hot spots,” or interactive buttons within each session, allow participants to look closer, gather more information or answer quiz questions.

The most common reaction, says Stevenson, is “Wow!”

The training tools are also compatible with standard tablet, mobile or desktop screens. This makes them widely accessible for both educational and industry use.

We can bring the factory itself inside the classroom, which is amazing.

“Not many companies are exploring virtual reality for their training programs, so we’re building a code of practice that they could adopt,” Stevenson said.

The team, whose work was partially funded by the NC State Office of Outreach and Engagement, includes virtual reality specialist Elias Clarke Campbell and instructional designers Bethanne Tobey and Julie Yamamoto.

Their work was used in an online course on Good Manufacturing Practices as part of a contract for the North Carolina Department of Agriculture and Consumer Services, which has also given Stevenson permission to repurpose the course for both college and continuing education students.

This means that college students and industry professionals will receive the same training as food safety inspectors within the government. Because those are the positions many students seek after graduation, Stevenson’s work gives them an edge in the job market.

Stevenson foresees a workforce shortage of food safety professionals as baby boomers retire. He is researching the extent to which virtual reality can enhance expertise in food safety – behavior, skills, knowledge or all of the above.

“This all looks really cool, but we’re not doing it to play with gadgets – what matters is keeping unsafe food out of your fridge,” Stevenson said.



Nutrition Master’s Program Ranks Top in the U.S.

The department recently ranked No. 1 in the nation when it comes to online master’s of nutrition programs, according to BestColleges.com.

The non-thesis degree program totals 36 credit hours, six of which are obtained through a direct practicum or internship. Emphasis options include human nutrition, food and bioprocessing, or feed science. Courses incorporate nine credits of professional skills development that qualify students for the Professional Science Masters (PSM) designation.

#1

According to Dr. Jonathan C. Allen, FBNS’ graduate programs director, students who complete the program have a broad yet fundamental understanding of nutritional science and related fields.

NC State uses two learning management systems, Moodle and WolfWare Classic – the latter developed at NC State. The combination allows course content to be entirely web-based and increases the interaction level between students, classmates and instructors.

Although most online coursework can be completed asynchronously, Blackboard Collaborate is used for synchronous elements, while assignments, homework, tests and quizzes are done through WebAssign, a software tool.



CRACKING THE CRISPR CODE

Imagine you're a virus – but not just any virus. You're a bacteriophage, or a virus that specifically attacks bacteria.

You operate by invading a bacterium and hijacking its cellular machinery to overwhelm and devour it while producing more copies of yourself. You grow more powerful by moving on to an adjacent bacterium and devouring it too. Soon, you'll conquer the world!

Or you might, if not for one problem: Many bacteria have an adaptive defense system that can recognize foreign DNA and use a special molecular scalpel to cleave it from their cells and destroy it.

Moreover, this adaptive defense mechanism performs double duty as a sort of genetic tape recording that remembers previous phage attacks and how to respond to them, providing immunization against future phage attacks of a similar type.

You, virus, have been foiled by a tool known as CRISPR, a microbial adaptive immune system that has been co-opted into a cut-and-replace gene-editing system currently taking the scientific world by storm.

A New Take on Cut-and-Paste

CRISPR pioneer Rodolphe Barrangou has spent more than a decade working on the gene-editing system that is revolutionizing modern science.

CRISPR has potential applications for crop production, ag biotechnology and myriad other important processes and industries. It promises to be a Swiss army knife for genome editing in life forms from bacteria to humans.

While researchers across the globe are quickly jumping on the bullet train that is the CRISPR bandwagon, a pioneering NC State professor has spent more than a decade helping move the bandwagon forward, authoring dozens of refereed journal articles and chalking up around 20 patents along the way.

Beyond Cheese and Yogurt

Food scientist Rodolphe Barrangou clearly remembers his CRISPR “eureka” moments. Shortly after earning his Ph.D. in functional genomics under Todd Klaenhammer in NC State’s food science department in 2004, Barrangou worked to produce better bacterial starter cultures for cheese and yogurt at Danisco, a food ingredients company in Madison, Wisconsin.

Barrangou and his colleagues sequenced genomes – the complete set of genes – for dairy bacteria such as *Streptococcus thermophilus*. That particular bacterium

breaks down lactose, a sugar in milk, and turns it into lactic acid, an important ingredient in cheese and yogurt as well as in pickled vegetables and fermented products.

But Barrangou’s team had difficulty putting the dairy bacterium genome puzzle together. Think of assembling a multimillion-piece jigsaw puzzle without having a picture template to know exactly what it should look like. The reason? CRISPRs.

CRISPR promises to be a Swiss army knife for genome editing in life forms.

In the alphabet soup of cellular DNA sequences, which are represented by the letters A, T, G and C that correspond to the chemical building blocks of DNA – adenine, thiamine, guanine and cytosine – a CRISPR looks like a relatively short, repetitive DNA sequence, after which comes a sequence of two or three dozen letters known as “spacer” DNA, followed by another palindromic sequence just like the first.

“They weren’t called CRISPRs a decade ago. We called them SPIDRs, for ‘spacers interspersed direct repeats,’” Barrangou says. “They kept breaking down the assembly process as we sequenced these bacterial genomes. We knew they were part of the DNA repeat family, but we didn’t know what they did or why they mattered so much.”

At the same time, Barrangou and his Danisco colleagues also were sequencing genomes of important phages involved in cheese and yogurt manufacturing. While comparing and contrasting these phage DNA sequences with the bacterial DNA sequences, patterns emerged.

“Some of the spacer DNA sequences we found in bacteria were close matches to monkey pox, frog pox and ringworm virus sequences,” Barrangou says. “One of the key



moments was when we realized that those were actually real viral sequences. In hindsight we know now that these elements were a record of viruses that the bacterium had vaccinated itself against.

“The CRISPR content of those bacteria, the way they clustered together by similarity, is correlated with their profiles of resistance to the phage,” Barrangou adds. “That was a key element showing that there was a link between the function of phage resistance and the genetic makeup of CRISPR content.”

At the same time in summer 2005, three independent research groups published papers suggesting that CRISPRs and their spacer DNA were indeed important. The research found that bacterial spacer DNA matched foreign genetic

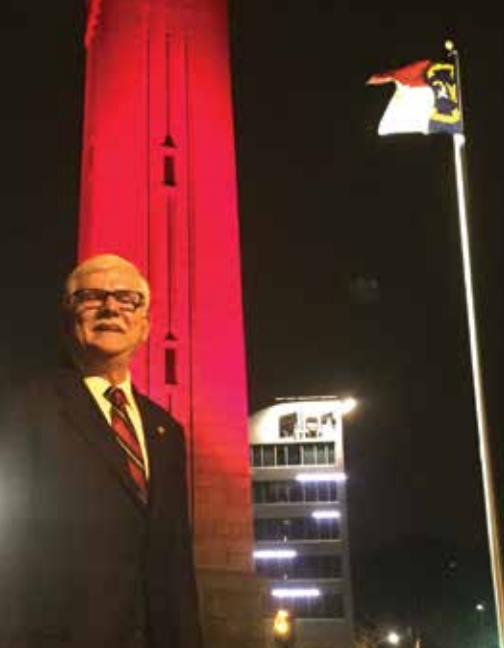
elements, which provided clues that it could be involved in bacterial immunity.

Armed with the knowledge from these papers and their own lab work, Barrangou and his Danisco colleagues published a seminal paper in the journal *Science* in 2007, showing that the *S. thermophilus* bacterium could be engineered to either resist or succumb to attack from phages by altering the spacer DNA that matched the phage DNA.

“That paper showed CRISPR is indeed an adaptive immune system with the functional ability to acquire genetic snapshots of phage attacks,” Barrangou says.

Reprinted with permission from Results, Jan. 6, 2016.
Read the full story online: <http://bit.ly/2dGTi2h>





Swartzel Elected to National Academy of Engineering

Dr. Kenneth R. Swartzel, William Neal Reynolds Distinguished Professor Emeritus, was elected to the National Academy of Engineering (NAE), one of the highest distinctions accorded to an engineer.

NAE is a private nonprofit organization that provides engineering leadership in service to the nation. Swartzel was formally inducted during a ceremony at the NAE's Annual Meeting in Washington, D.C., on Oct. 9, 2016.

He was cited for advances in the thermal processes of food preservation. He is widely known for blending basic engineering with chemical and biological kinetics to develop new preservation processes that yield high-quality, nutritious, safe and economical foods.

Swartzel's research in continuous flow food processing systems has led to 24 U.S. and 32 foreign patents. Royalties to NC State from licensed patents from his lab have exceeded \$20 million, with eight start-up companies all founded in North Carolina.

Swartzel has won numerous awards at NC State and globally. He is a fellow of both IFT and the American Society for Agricultural and Biological Engineers. In 2006 he received the Alexander Quarles Holladay Medal for Excellence, NC State's highest award for faculty career achievement and service, and he was named NC State University's 2012 Innovator of the Year. He was also awarded the North Carolina Order of the Long Leaf Pine by Gov. Perdue.

Swartzel's published more than 120 scientific papers and been principal or co-principal investigator on projects with more than \$26 million in outside support. He retired from NC State in 2015, after 40 years of service, including 10 years as department head.

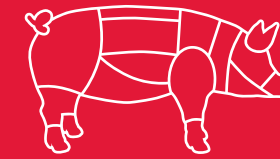
FBNS IN THE NEWS

Gary Cartwright and **Carl Hollifield** are featured in this article about PowerPack, the newest Howling Cow dairy product. <http://bit.ly/2dBqeYG>

Dr. LeeAnn Jaykus is profiled in *Results* magazine for her work directing the

USDA's Food Virology Collaborative. <http://bit.ly/2dq6lCB>

Dr. John Sheppard is featured in *All About Beer* magazine for his work in craft brewing. <http://bit.ly/2dGWlal>



NC State BBQ Camp

THE SCIENCE OF  LOW AND SLOW

THE SCIENCE OF LOW AND SLOW

"This is really like going back to school, not like some cooking class," one participant said of the NC State BBQ Camp. Indeed, the event proved that what makes barbecue delicious is far more than firing up the grill.

Hosted by FBNS and the North Carolina Meat Processor's Association, the two-day seminar was the first public offering of a university-level, science-based class in the Southeast. To prepare for the event, the two groups conducted a test camp in 2015 and several shorter sessions for North Carolina 4-H members.

Limited to 25 participants, tickets sold out almost immediately. "I was going to plug it in an interview on Friday but found out it was sold out on Thursday," said WUNC-TV host and noted author Bob Garner. "A small mention in Wednesday's *Raleigh News & Observer* food section beat me to the punch!"

For the 28 people who missed the cutoff, it was a big disappointment. "We're keeping a list of everyone who didn't get in," said the NCMPA's Candace Cansler. "We'll certainly let them know the next time we have one."

Participants included an entertainment lawyer from New York City, a barbecue competition veteran from Connecticut and aficionados from across North Carolina. Individual skill levels pre-class ranged from highly experienced to those who just enjoyed eating what local columnist Dennis Rogers proclaimed the "Holy Grub."

Read the full story online: <http://bit.ly/2cOftNu>

A LASTING LEGACY

One of the country's leading microbiologists for nearly 40 years, FBNS alumnus **Dr. Russell S. Flowers** has made extensive contributions to food science, especially in the areas of food testing and food safety.

Flowers earned his bachelor's and master's degrees in food science at NC State. After retiring as Mérieux NutriSciences' president and chief scientific officer he established the **Russell S. Flowers Teaching and Training Endowment for Food Safety and Quality** at NC State, which recently made programmatic support possible for two new area specialized Extension agents in food safety education and training:

Dr. Lynette Johnston, (*below, left*) a curriculum coordinator and instructor in FBNS, teaches grad and undergrad food safety courses. She's been actively involved in training the food industry in preparation for the Food Safety Modernization Act. She earned her Ph.D. in food science from NC State in 2005.

Currey Nobles (*below, right*) earned his bachelor's degree in food science here in 2015 and is now working toward his master's degree under Dr. Dana Hanson. Nobles worked in the processed meats lab and on processed meat products R&D projects, as well as meat safety and quality. His graduate research focuses on processing parameters of bacon.



DEPARTMENT NOTES

We proudly welcome three new faculty members into our FBNS community. **Drs. Colin Kay and Mario Ferruzzi** recently started their tenure at NC State with Dr. MaryAnn Lila and the Plants for Human Health Institute. **Dr. Ondullah Toomer** is a nutrition chemist with USDA.

We acknowledge with deep gratitude **Dr. John Rushing**, FBNS emeritus, who is providing temporary assistance to our ei4F program as a process authority. Tristan Laundon, ei4F Program Director, recently accepted a position with Mt. Olive Pickle Co.

In Memoriam

Dwain H. Pilkington passed away on September 28, 2016. Pilkington was a Red Meat Extension Specialist in FBNS until his retirement in 1999. In this capacity he worked closely with many of the state's country ham processors and judged the country ham exhibit at the North Carolina State Fair.

Faculty Awards and Honors

Dr. Sarah Ash was selected as recipient of the 2016 Society for Nutrition Education and Behavior's Scholarship of Teaching and Learning Nutrition in Higher Education award.

Dr. Rodolphe Barrangou was named a recipient of the 2016 Canada Gairdner Award as well as the 2016 Warren Alpert Foundation Prize for his pioneering CRISPR work. He also recently was named the NC State University Dr. John S. Risley Entrepreneur of the Year.

Dr. E. Allen Foegeding received the 2016 Nicholas Appert Award at the IFT annual meeting. The Appert award is the organization's highest honor and is given to an IFT member for preeminence in and contributions to the field of food science and technology.

Dr. Keith Harris was selected as a 2016 Alumni Distinguished Undergraduate Professor. Only faculty with long-term, distinguished service in undergraduate teaching at NC State are considered for this award. Keith will retain this title for the duration of his appointment on the NC State faculty.



Dr. Todd Klaenhammer (center) at award ceremony with CALS Dean Richard Linton (left) and Chancellor Randy Woodson (right).

Dr. Todd Klaenhammer won NC State University's 2015 Innovator of the Year Award for his visionary leadership in the area of food microbiology and biotechnology. He and his research team have a distinguished intellectual property portfolio that has resulted in 36 issued patents and 22 licenses and executed options.

Dr. LeeAnn Jaykus received the 2016 Maurice Weber Laboratorian Award from IAFP. She also received the 2015 Outstanding Graduate Faculty Mentor Award from NC State.

Dr. Josip Simunovic was named the 2016 recipient of the IFT Research and Development Award, which honors those who are making significant contributions to advance the science of food. Simunovic was recognized at the annual meeting in Chicago.

Student Awards and Honors

For the second year in a row, FBNS students won first prize in the National Dairy Council's New Product Competition.

Congratulations to **Jeffrey Hymes, Andy Lee, Emily Stout** and **Dr. Tyre Lanier** for their award-winning creation, **Panikotta**, a new version of an authentic Italian dessert. Its honey vanilla base is made with ultra-filtered whole milk, Greek yogurt and cultured non-fat dry milk, providing 10 grams of protein per serving. Multi-compartment packaging houses mango fruit coulis and candied ginger bits.

Currey Nobles and **Travis Tennant** won awards in the university division of the 2016 American Cured Meat Championships. Nobles placed first with peppered round bacon, and Tennant won second with ham and olive aspic. In May, they won a gold medal of quality by the German Butcher's Association for a dry-cured capicola entered in a competition in Frankfurt, Germany.



Meat. The winners.

Curry Nobles (left) and Travis Tennant (right) pose with their awards with Dr. Dana Hanson, associate professor of food science. Nobles' peppered round bacon (left) and Tennant's ham and olive aspic (right) took top honors in Frankfurt.



PARTNERS AND DONORS

FBNS Endowed and Annual Scholarships

A. Tab Williams Jr. Endowed Scholarship
 Benjamin P. Forbes Scholarship
 Benjamin W. Kilgore Food Science Scholarship
 Burton M. Newell Award
 College of Agriculture and Life Sciences
 Agricultural Foundation Scholarship
 Cristie Abigail "Abbi" Fleming Dairy Science Scholarship
 David S. Weaver Alpha Zeta Scholars Program
 Dr. Frank and Rachel Kirby Thomas Food Science and
 Family Consumer Sciences Scholarship
 Dr. Isadore and Cynthia Peppe Food, Bioprocessing and
 Nutrition Sciences Scholarship Endowment
 Dr. Peggy Foegeding Memorial Food Science Scholarship
 Dr. Roy Lee and Virginia Brown Lovvorn Scholarship
 Dr. Wanida E. Lewis Food Science Fellowship Award Endowment
 Duong, Green and Gharst Food Science
 Leadership Award Endowment
 Eakes-Turner Food Science Scholarship
 Evander Ayers Davis Memorial Scholarship
 George T. and Marina T. Barthalmus Life Sciences
 Scholarship Endowment
 H. Hawkins Bradley Scholarship
 Harvey L. and Kathleen R. Barnes Scholarship
 Hase H. and Lena M. Smith Scholarship
 Ivan D. and Lillian T. Jones Food Science Scholarship
 J. Frank & Margaret B. Neely Scholarship
 James Everette Brown Scholarship

Endowments Supporting FBNS Faculty and Programs

Burton Newell Food Science Library Endowment
 David H. Murdock Distinguished Professorship
 Don Hamann Memorial Lectureship Endowment
 Dr. Wanida E. Lewis Food Science Fellowship Award Endowment
 Hugh C. Kiger Distinguished University Professorship Endowment
 Phi Tau Sigma Food Science Technical Staff
 Professional Development Endowment

James L. and Diana G. Oblinger Scholarship
 John and Kelli Rushing Food Science Freshman Scholarship
 John B. Steele Memorial Scholarship
 John Rushing, Southeastern Food Processors
 Association Scholarship
 Josephus Daniels Scholarship
 Leonard and Frances Crouch Scholastic Achievement Award
 Livio Ferruzzi Memorial Agricultural Scholarship Endowment
 Mid-Atlantic Food Boosters Inc. Scholarship
 Mitchell F. Allen Jr. Memorial Scholarship
 Mose and Helen Kiser Scholarship
 Neil and Nancy Webb Memorial Food Science
 Scholarship Endowment
 North Carolina Meat Processors Association Scholarship
 in memory of John W. Long
 Raymond F. Shearin Scholarship
 Robert Lee Lewis Agricultural Scholarship
 Robert N. Wood - N.C. Dairy Products Association
 Memorial Scholarship
 Robert R. Fountain Memorial Scholarship
 Roy R. and Alice Barber Bennett Scholarship
 Scholarship in Memory of Pat Butler
 Stephanie Christine Anderson Memorial Scholarship
 T. W. Garner Food Company (Texas Pete) Scholarship
 Victor and Maryetta Jones Scholarship
 W. F. and Mozelle Parker Scholarship
 W. J. Peele Scholarship

Russell S. Flowers Teaching and Training Endowment for
 Food Safety and Quality
 Thomas N. Blumer Endowment
 Todd R. and Amy E. Klaenhammer FBNS
 Graduate Award Endowment
 Todd R. Klaenhammer Distinguished Professorship in
 Probiotics Research Endowment

Donors to FBNS Funds (7/1/2015 – 6/30/2016)

Allied Bioscience Services Inc.
 Jean E. Anderson
 Bowen Sales LLC
 Craig A. Bromby
 Canadian Business Association of N.C.
 Cargill Inc.
 Carolina Dairy Inc.
 Carolina Fine Snacks
 Catawba College
 Richard K. Chumney
 Clearly Better LLC
 Malcom W. Crawford
 Dairy Farmers of America
 Danisco - Cultures Division
 Darigold Inc.
 Christopher R. and Katie R. Daubert
 Davisco Foods International Inc.
 Dean Foods Company
 Diversey
 Dole Food Company Inc.
 Tri Duong
 East Coast Digital Printing
 Ecolab Inc
 Jack M. Fleming
 Gregory A. Gharst
 Glanbia Business Services Inc.
 Gojo Industries
 Goodnight Brothers
 Paul Graham
 Hampton Farms
 Harris Teeter LLC
 Ronald A. Heddleson
 Hershey Foods Corporation Fund
 Alice A. Heth
 Joseph Holland Hildebrand
 Larry G. Hoffman and Darlane Hoffman
 Holiday Inn Express
 Johnson Diversified Products Inc.
 Douglas R. Jones
 Victor A. Jones and Maryette Jones
 Charles D. King and Rebecca M. King
 James A. King II and Joy Batchelor King
 Kai Koo
 Lindy's Homemade LLC
 Livingstone College Inc.,
 UNCF Operating Account
 Wallace S. Mahanes
 Marketing Consulting Services
 Mid Atlantic Dairy Food Boosters Inc.
 Milkco Inc.
 National Watermelon Association Inc.
 N.C. Cattlemen's Association
 N.C. Meat Processors Association Inc.
 M.G. Newell Corporation
 Margaret R. Overbey and Charles F. Overbey Jr.
 Ms. Sophia L. Overdiep
 Ms. Vishal Patil
 Maj. Gen. Timothy A. Peppe, USAF (Ret.) and
 Col. R. J. Peppe, USAF (Ret.)
 Pfeiffer University
 Virginia W. Pickett and Marquis D. Pickett
 Pickle Packers International Inc.
 Piedmont Milk Sales Inc.
 Nathan D. Poland
 Public Health Innovations LLC
 The Randleigh Foundation Trust
 RDI Foods LLC
 Robertet Flavors Inc.
 John E. Rushing and Kelli K. Rushing
 Arnie I. Sair and Kara L. Sair

Schotland Business Research Inc.
 Sensient Flavors
 Sharp Farms Inc.
 Josip Simunovic and Nada Simunovic
 Smithfield Hog Production
 Starbucks Coffee Company
 Walter W. Stewart II
 Ms. Dahlia Suriaatmaja
 Stephen F. Sylvia
 Rachel K. Thomas
 Corey A. Troutman and
 Katherine K. Troutman
 Lynn G. Turner and Beth E. Turner
 Utah State University
 Vine Life Company
 Pamela J. Warrick and Kirby Warrick
 Natalie J. Webb
 Wenda America Inc.
 J. Graham White Jr. and
 Marianne K. White
 Wilson Pringle Associates

NC State University

Department of Food, Bioprocessing
and Nutrition Sciences
Campus Box 7624
Raleigh, NC 27695-7624



The future of food depends on FBNS – and you.

There are all sorts of ways to support our faculty, students and programs.

Log on today and choose exactly where you'd like your contribution to go.

No amount is too small.

And every gift is appreciated.

go.ncsu.edu/fbns_fund

Connect with FBNS, its alumni and friends!

NC STATE UNIVERSITY

ncsu.edu/fbns

facebook

FBNS NCSU

LinkedIn

NCSU Department of
Food, Bioprocessing
and Nutrition Sciences
Department Alumni