

Good Afternoon Chairman Peterson, committee members, ladies, and gentlemen, thank you for the opportunity to appear here today to discuss the 2012 Farm Bill. My name is Gary McMurray and I am the Division Chief for the Food Processing Technology Division at the Georgia Tech Research Institute (GTRI). I am honored to lead a team of 13 full-time research professionals, 4 academic professors, and 20 students working in the areas of image processing and sensing (food quality and food safety), robotics and automation, energy, and environmental engineering in support of the food processing industry.

We are primarily funded through the State of Georgia's Agricultural Technology Research Program (ATRP). The program's mission is to conduct basic and applied research focused on the development of new technologies that improve productivity and efficiency in the processing operations of Georgia's agribusiness community. Particular emphasis is placed on the commercialization of these technologies and we work closely with our industrial partners to facilitate this. We have licensed 10 systems/technologies to commercial companies in the past 15 years. In addition, we have a mandate to educate engineers to prepare them for careers in the food industry as well as provide technical outreach and assistance to the industry. We also work closely with our colleagues at the University of Georgia (UGA) on many projects. This team approach allows the application and transfer of knowledge from multiple disciplines to deliver the best possible solution for each research challenge.

For more than 35 years, ATRP researchers have developed numerous innovations that have improved food, particularly poultry, processing operations. Food safety technologies have also been a key focus area of the program. ATRP has funded groundbreaking work in the rapid

detection of pathogens and chemicals. Our biosensor uses an interferometric optical measurement system for rapid, on-line quantification of various chemicals and pathogens in the food system. The research team, working with UGA and under USDA funding, recently demonstrated the system's ability to quickly and accurately identify avian influenza in live chickens. This system has also led to two commercial licenses.

One of the reasons for the success of our program has been the partnership we have with the food processing industry, our colleagues at UGA, and the Georgia Poultry Federation. With the help and support of the Georgia Poultry Federation, we have assembled a first-class advisory board that consists of top management as well as plant and complex managers from some of the nation's leading poultry processing companies. This advisory board plays a critical role in identifying the industry's technology needs and guiding the technology development process.

In addition to the Agricultural Technology Research Program, the State of Georgia has funded the Food Industry Partnership (FIP) program that is focused on the commercialization of technology for the broader food industry. FIP has funded numerous projects focused on food safety, water conservation, automation, and imaging for the red meat, fruit and vegetable, peanut, and baking industries. This unique program uses an industry-led committee to select projects that have broad industry appeal. Each project brings together an academic research team, an end-user, and a commercial partner to bring the system to market.

The USDA NIFA program is an important new initiative that should generate interest from the research community. Food safety is a major focus of the program and it is one that requires a multidisciplinary team. Our approach to food safety, from a technology development point of

view, has been to not only consider the specific technologies required to achieve it, but also to consider the food chain as a system, not just individual parts. The manufacturing industry realized many years ago that you cannot inspect quality into a product, but instead, you must learn to control the process with adequate statistical control procedures and effective control policies. You only use inspection to verify that the process is under-control. I believe this approach needs to be applied to our food system as well. A systems-level approach to the food system (farm to fork) would focus on identifying the appropriate control points, sampling requirements, sensor requirements, data requirements, policies, and procedures that would ensure the safety of the food chain but not impose significant costs on the system. Then, the correct handling of the product through the system that would ensure that the product arrives safely to the consumer is defined and a methodology for controlling that process is devised. In addition, the information system to convey that information to the appropriate decision makers is equally important. Requiring 100% inspection of the product at any point along the food chain is neither cost-effective nor necessary as long as the rest of the supply chain is not “in control.”

By adopting this approach, the value to the industry and the consumer is two-fold. First, there is increased food safety. It is important to instill public confidence in the safety of the nation’s food supply. Only through a systems approach can we achieve this. Second, we can reduce the waste/spoilage of product throughout the supply chain. The need for increased food production has been well documented. The population of the world continues to grow and with it, the need for more food. While we need to address the critical issue of food production, the first step should be to drive out the waste in the current system. Researchers can partner with

farmers to better understand the initial state of the product at the farm (through sensors) and monitoring its state through the food chain. The information can be used with predictive models (simulating the variety of conditions by product as it is transported through the chain) to enable better decisions and increase the economic benefit for all participants in the system. I believe that by increasing the flow of data throughout the entire food chain, spoilage (or waste in the system) can be dramatically decreased and at the same time overall food safety can be maintained.

The current RFA from USDA NIFA is focused for the large part on very specific issues in food safety. This approach is very appropriate for the development of fundamental science, but it does not facilitate a systems approach as discussed earlier. I encourage the USDA NIFA to craft broader scoped projects that allow for the development of teams with diverse backgrounds to address the system as a whole. I also encourage the USDA to focus on technology development that can be translated into commercialized hardware and software systems. Developing systems that can do more for the farmer brings benefit not only to the farmer, but it sustains an entire industry of equipment companies, distributors, sales people, and support people. This creates real jobs and helps build the nation's rural communities.

The problems facing our agricultural system are complex ones that require multidisciplinary team-based solutions. I believe the best teams can be formed by joining researchers from both land-grant and non-land-grant universities. These teams require skills typically found at the land-grant institutions such as microbiology, food science, and animal science. However, the non-land-grant institutions are an untapped resource that can supplement the research teams

and allow them to tackle the larger problems. I strongly feel that the non-land-grant universities have a tremendous amount of technology and skills that can be brought to bear on the problems that face our agricultural system. While GTRI is considered one of the preeminent sensors universities in the nation for the Department of Defense (DoD), very little of that work has translated over to the agricultural community. Within the DoD world, sensors for detection of various chemicals are well known and commonly deployed. In addition, the DoD has invested heavily in multispectral and hyperspectral imaging as a means to collect data and identify objects of interest. This technology has many applications to the agricultural community. Can these non-land-grant universities address these problems alone? No. They still need to partner with the land-grant universities because that is where the domain-specific knowledge resides. They must partner to accomplish the greater goals of USDA.

GTRI recognizes the important work that USDA NIFA is doing and as such we have already submitted three letters of intent for proposals to this program. We believe that collaboration is vital to this work and our proposed team reflects that spirit. Our team includes experts at the University of Georgia as well as other universities such as Oklahoma State, the University of Tennessee, and North Carolina A&T State University. The multidisciplinary teams include experts in signal processing, sensor systems, environmental engineering, and energy systems that are working with their counterparts in economics, poultry science, microbiology, and food science to work on projects of mutual interest.

One hindrance to fostering such collaborations between land-grant and non-land-grants institutions is the cap on university overhead rates. Today's major engineering universities

drive innovation in every economic sector other than agriculture. These universities will be deterred from participating in USDA opportunities until the overhead issue is revisited. A partnership between engineering universities with their systems approach and technology focus and land-grant universities with their agriculture expertise would be a powerful team to address food safety issues and would provide a great service to the food industry and to consumers. They must partner to accomplish the nation's food safety goals.

The entire Georgia Tech community looks forward to working with USDA and NIFA to solve the problems that face our food industry. We know that these problems are critical to maintaining one of the most important industries to our nation and our world. The challenges are large, but I am confident that through a systems approach coupled with integrated, multidisciplinary teams, we can begin to solve these problems in a cost-effective manner that will maintain the public's confidence in the safety of our food supply. I look forward to working with the USDA, the academic community, and the industry to achieve these goals.

I would be happy to respond to any questions that the Members might have.

## **Gary McMurray**

Georgia Tech, GTRI/ATAS/FPTD (Food Processing Technology Division)

(404) 407-8844

[gary.mcmurray@gtri.gatech.edu](mailto:gary.mcmurray@gtri.gatech.edu)

**April 2009 – Present, Division Chief, Food Processing Technology Division, GTRI** – Leads a division of 23 professionals with diverse technical skills. The current business for FPTD is the development of systems to solve the complex problems for our customers in the food industry (sensing for food safety and product quality, robotics, energy and environmental), transportation (automation of road maintenance tasks and roadway monitoring), and energy (fuel cells, batteries, and hybrid performance systems).

- Works with GTRI and GT collaborators to develop a systems approach to the food chain on a national and international level with an emphasis on:
  - Food safety
  - Product quality

- Reduction of product waste
  - Greater efficiency throughout food chain
- Works with team to market GTRI in the unmanned systems area. Leading the technical work in:
  - Autonomy and control
  - Image processing
  - Tele-operation of robotic systems
- Works with FPTD members to maintain and build industry relations with companies throughout the food chain
  - Industrial Advisory Board
  - GTRI publications
  - Industry groups
  - Conferences
- Leads the biomedical research performed with our partners at Emory University

**July 2003 – April 2009, Robotics and Automation Group Leader, Food Processing Technology Division, GTRI** – Group Lead for a diverse eleven member team conducting cutting edge mechatronic research for the biomedical, military, and industrial sectors.

- Initiated and developed new areas of research in colon cancer detection and treatment in conjunction with Emory University. The effort resulted in ongoing collaborative relationships within GTRI as well as with GT, Emory, University of Minnesota – Duluth, and University of Texas – San Antonio.
- Team Lead for marketing GTRI expertise and developed technologies to DoD Unmanned System Program Offices. Participating in proposal development at this time.
- Initiated and developed new DARPA/DoD funding opportunities for group members through ATAS led projects
- Developed critical in-house electromechanical design and real time control capabilities to meet future division marketing and research requirements.
- Have supervised 40 students including Ph.D. candidates, master students, undergraduate interns and co-ops, and high school interns.
- Works with an interdisciplinary team to achieve desired business goals.

**November 1989 – Present, Principal Research Engineer, Food Processing Technology Division, GTRI**

Leads the development of advanced robotic systems for the food, transportation, and biomedical industries. Division lead for identifying and marketing new research opportunities for automated solutions in food, transportation unmanned systems, and biomedical sectors. Has an excellent track record for designing, testing and delivering innovative robotic solutions for the food and biomedical as well as for the Department of Defense. Works extensively with GTRI and Georgia Tech researchers to facilitate these efforts.

- Food industry. Through a detailed understanding of the industry and their needs and problems, he has been able to craft a research plan to address the future of the poultry industry with focused research.
  - 20 Years experience marketing and working with the Georgia Poultry Industry, Poultry Federation, and members of the legislature to support this industry. Clear understanding of the industry's current technology, business growth initiatives, and Georgia's political committees needs and desires.

- Led research teams that have resulted in commercial systems, basic research that is critical to saving the industry millions of dollars per plant, and fundamental research that has broad application in other application areas.
- Recognized expert on robotic technologies and their application to food processing and packaging. Invited to present research at both national and international conferences.
- Biomedical. Initiated work to develop new technology to support doctors performing minimally invasive procedures and add new functionality to these procedures.
  - Have developed working system of intelligent endoscope that has been used in two animal tests.
  - Working with colleagues in GTRI, Georgia Tech, Emory and University of Texas – San Antonio to develop technology to aid doctors and increase the detection of colon cancer through the development of control systems, integration of sensor technology, and imaging techniques.
- Unmanned systems. Working with recognized experts to market GTRI as technology integrator and technology supplier to DoD.
  - Co-Inventor of patented Visual Servoing Technology that is one of the key enabling technologies being marketed in this unmanned systems initiative.

**January 1989 – June 1992 – President, Quanta** – Started Small Robotic Technology business that successfully designed and presented plans for controlling Space Station Robotic Platforms. The technology based on a NASA SBIR resulted in the licensing of technology for commercial product development. Led the technical effort for the SBIR as well as developed a business plan for the commercial product, developed strategic alliances, and worked with users to define value of technology and product placement. Led negotiations to license the technology to another company to bring to market.

Patents Awarded:

- a. 2009, 0259099 – Image Based Control System (Intelligent Endoscope) – patent applied
- b. 6,278,906 – Uncalibrated Dynamic Mechanical Systems Controller
- c. 6,260,783 – Automated Yarn Creeling Device
- d. 5,969,339 – Conveyor Tracking System for Part Detection Using an Array of Photoelectric Sensors

MSME, 1987, Georgia Tech

BSME, 1985, Georgia Tech

**Committee on Agriculture  
U.S. House of Representatives  
Required Witness Disclosure Form**

**House Rules\* require nongovernmental witnesses to disclose the amount and source of Federal grants received since October 1, 2007.**

**Name:** Gary McMurray

**Address:** 640 Strong Street, MC 0823, Atlanta, GA 30332

**Telephone:** (404) 407-8844

**Organization you represent (if any):** \_\_\_\_\_

1. **Please list any federal grants or contracts (including subgrants and subcontracts) you have received since October 1, 2007, as well as the source and the amount of each grant or contract. House Rules do NOT require disclosure of federal payments to individuals, such as Social Security or Medicare benefits, farm program payments, or assistance to agricultural producers:**

**Source:** \_\_\_\_\_ **Amount:** \_\_\_\_\_

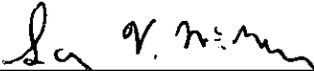
**Source:** \_\_\_\_\_ **Amount:** \_\_\_\_\_

2. **If you are appearing on behalf of an organization, please list any federal grants or contracts (including subgrants and subcontracts) the organization has received since October 1, 2007, as well as the source and the amount of each grant or contract:**

**Source:** \_\_\_\_\_ **Amount:** \_\_\_\_\_

**Source:** \_\_\_\_\_ **Amount:** \_\_\_\_\_

**Please check here if this form is NOT applicable to you:**  X

**Signature:** 

\* Rule XI, clause 2(g)(4) of the U.S. House of Representatives provides: *Each committee shall, to the greatest extent practicable, require witnesses who appear before it to submit in advance written statements of proposed testimony and to limit their initial presentations to the committee to brief summaries thereof. In the case of a witness appearing in a nongovernmental capacity, a written statement of proposed testimony shall include a curriculum vitae and a disclosure of the amount and source (by agency and program) of each Federal grant (or subgrant thereof) or contract (or subcontract thereof) received during the current fiscal year or either of the two previous fiscal years by the witness or by any entity represented by the witness.*

**PLEASE ATTACH DISCLOSURE FORM TO EACH COPY OF TESTIMONY.**