ATRP
AGRICULTURAL TECHNOLOGY RESEARCH PROGRAM

2015 ANNUAL REPORT

ADVANCED IMAGING AND SENSOR CONCEPTS
WORKER AND FOOD SAFETY TECHNOLOGIES
ENVIRONMENTAL AND ENERGY SYSTEMS
ROBOTICS AND AUTOMATION SYSTEMS
**OUR VISION**

TO BE THE TECHNOLOGY INNOVATION AND DEVELOPMENT PROVIDER THAT ENABLES GEORGIA TO BE RECOGNIZED AS THE UNDISPUTED LEADER IN POULTRY, AGRIBUSINESS, AND FOOD PROCESSING

**FY 2015 PROGRAM HIGHLIGHTS**

[**JULY 1, 2014 - JUNE 30, 2015**]

- **7** RESEARCH PROTOTYPES IN VARIOUS STAGES OF DEVELOPMENT
- **7** EXPLORATORY RESEARCH PROJECTS FUNDED TO DEVELOP CONCEPTS AND IDEAS FOR LATER TRANSITION INTO FULL-SCALE RESEARCH PROJECTS
- **2** PROVISIONAL PATENTS; 3 INVENTION DISCLOSURES; AND MORE THAN 40 PUBLISHED ARTICLES, PAPERS, AND PRESENTATIONS ON RESEARCH DISCOVERIES
- **12** INDUSTRY AND ACADEMIC PARTNERS PARTICIPATED DIRECTLY IN ONE OR MORE RESEARCH PROJECTS
- **31** TECHNICAL ASSISTANCE SERVICES PROVIDED TO COMPANIES OR INDIVIDUALS THAT HELPED SOLVE A PROBLEM OR PROVIDED USEFUL INFORMATION

**FY 2015 FINANCIAL SUMMARY**

**TOTAL FUNDING: $1,650,000**

[ANNUAL FUNDING PROVIDED BY THE STATE OF GEORGIA]

- PROGRAM DEVELOPMENT — 4%
- TECHNOLOGY TRANSFER/OUTREACH/TECHNICAL ASSISTANCE — 14%
- WORKPLACE SAFETY RESEARCH — 1%
- FOOD SAFETY RESEARCH — 10%
- ENVIRONMENTAL AND BIOLOGICAL SYSTEMS RESEARCH — 19%
- IMAGING AND SENSING RESEARCH — 16%
- ADVANCED AUTOMATION RESEARCH — 21%
- PROFESSIONAL DEVELOPMENT — 1%
- PROGRAM ADMINISTRATION AND OPERATIONS SUPPORT — 14%
- INDUSTRY AND ACADEMIC PARTNERS PARTICIPATED DIRECTLY IN ONE OR MORE RESEARCH PROJECTS — 12
- TECHNICAL ASSISTANCE SERVICES PROVIDED TO COMPANIES OR INDIVIDUALS THAT HELPED SOLVE A PROBLEM OR PROVIDED USEFUL INFORMATION — 31
- RESEARCH PROTOTYPES IN VARIOUS STAGES OF DEVELOPMENT — 7
- EXPLORATORY RESEARCH PROJECTS FUNDED TO DEVELOP CONCEPTS AND IDEAS FOR LATER TRANSITION INTO FULL-SCALE RESEARCH PROJECTS — 7
- PROVISIONAL PATENTS; INVENTION DISCLOSURES; AND MORE THAN 40 PUBLISHED ARTICLES, PAPERS, AND PRESENTATIONS ON RESEARCH DISCOVERIES — 2
- INDUSTRY AND ACADEMIC PARTNERS PARTICIPATED DIRECTLY IN ONE OR MORE RESEARCH PROJECTS — 12
- TECHNICAL ASSISTANCE SERVICES PROVIDED TO COMPANIES OR INDIVIDUALS THAT HELPED SOLVE A PROBLEM OR PROVIDED USEFUL INFORMATION — 31
MESSAGE FROM THE PROGRAM MANAGER

Innovative technology development is at the heart of the Agricultural Technology Research Program (ATRP) here at Georgia Tech. Our FY 2015 portfolio of research projects continued to tackle some of the poultry industry’s most pressing challenges. From near-term solutions to processing demands to the “thinking outside-the-box” concepts for the poultry plant of the future, each project helps to drive transformational innovation.

The fertile ground for transformational innovation is often found at the intersection of the disciplines, where the paths of curious and interested people with varied backgrounds cross. The interdisciplinary nature of ATRP projects allow us to work collaboratively with a wide group of industry and academic partners. And that collaboration contributes significantly to the overall success of the individual research projects and the overall program. We are truly appreciative of all who have partnered with us this past year.

I invite you to review this year’s ATRP Annual Report, which gives a glimpse into our research program as well as our educational outreach and technical assistance initiatives. As always, you can learn more about any of these endeavors online at www.atrp.gatech.edu.

Thank you for your continued support of ATRP, and please consider how you might be able to partner with us as we drive transformational innovation in the poultry industry together.

Doug Britton, Ph.D.
ATRP Program Manager

FULL-SCALE RESEARCH PROJECTS

Full-scale research projects address critical issues facing poultry processing and production.

INTELLIGENT CUTTING AND DEBONING SYSTEM
ATRP’s intelligent cutting research team successfully performed automated bird shoulder cuts on a moving poultry deboning cone line. The soon-to-be-commercialized Intelligent Cutting and Deboning System performs precision cuts that optimize yield while eliminating the risk of bone fragments in finished poultry products. To date, the yield rivals that of a human deboner.

CHICKEN EGG FERTILITY DETECTION
In FY 2015, research chemists completed work on the development of a proprietary technique to predict fertility and embryonic development in poultry eggs. Because 10 to 30 percent of eggs in hatcheries may be infertile (depending on the age of laying hens), the technique could help hatchery managers quickly test the fertility of eggs. This would ensure only fertile eggs are transferred to the incubator while optimizing operations at the same time.

ROBOTIC SENSING AND GRASPING
The robotics and automation group began development on several improved and more dexterous grippers and manipulators along with associated 3D imaging sensors for robotics. Applications for these tools include pick-and-place poultry processing tasks like loading birds on deboning cone lines.

NOVEL SEPARATION TECHNOLOGIES FOR POULTRY PROCESSING LIQUID STREAMS
Environmental engineers optimized their proprietary filtration method for processing facility effluents. The so-called dynamic filtration method was tested on actual processing effluent and found to provide significant advantages over currently used filtration methods. Specifically, dynamic filtration gives increased recovery of fine suspended solids such as fats and proteins, providing more material for rendering. It also provides enhanced opportunities for water reuse and recycling inside a processing plant.

MONITORING BIRD WELL-BEING IN BROILER HOUSING USING AUDIO
ATRP researchers further developed key components of their innovative Growout Monitoring System, which records and analyzes the vocalizations of birds to evaluate their well-being during the growout cycle. Notably, more advanced algorithms were added to the system’s Vocalization Processing Testbed to allow for offline and remote data analysis and processing. Researchers believe this lays the foundation for creating an ecosystem that allows for more holistic approaches to monitor the conditions of birds raised in confined housing.
**EXPLORATORY RESEARCH PROJECTS**

Exploratory research projects are higher risk smaller scope efforts that seek to develop concepts and ideas for later transition into full-scale research projects.

**INVESTIGATION OF LEG DEBONING**
The robotics and automation group studied chicken leg anatomy and the current manual leg deboning operation. The analysis found the current state-of-the-art in automated leg deboning is adequately meeting industrial needs, and any technology improvement would lead to only incremental yield improvements at best.

**EVALUATION OF NOVEL INTERVENTION STRATEGIES FOR PATHOGEN CONTROL**
Food safety scientists developed a group of new metal-based compounds to reduce pathogens in food products. The compounds exhibit promising antimicrobial properties, particularly in the control of *Salmonella*, one of the most common foodborne pathogens.

**TRACTOR TRAILER SHACKLE SYSTEM FEASIBILITY ASSESSMENT**
ATRP researchers studied the economic and mechanical feasibility of using alternative systems to replace cages in poultry transport tractor trailers. Analyses suggest that a trailer redesign could save close to 20 percent of transportation costs by reducing labor requirements and shortening loading and unloading times.

**WORKER SAFETY RESEARCH FOR THE POULTRY INDUSTRY**
The worker safety research group evaluated the performance of a Mobile Motion Capture System that uses smartphone technology and motion sensors to capture and then analyze ergonomic data from poultry plant workers as they perform their jobs. Researchers found the system is a feasible tool for optimizing workers’ performance, which could potentially lead to increased productivity while reducing the risk of injury.

**EXPLORATORY INVESTIGATION OF ICE-WATER SLURRY FOR ENHANCED ANTIMICROBIAL ACTIVITY**
ATRP researchers investigated the use of ice slurry as an alternative chilling medium for poultry processing. The mixture of micro-sized ice crystals and water exhibited excellent chilling ability, with experiments resulting in the ice slurry decreasing carcass core temperatures from 40°C to 4°C in 45 minutes, and with an average chilling solution temperature of -1°C. Researchers believe the slurry’s cooling capacity makes it a potentially effective antimicrobial aid.

**ADVANCED ENRICHMENT REACTOR**
With the goal of achieving real-time detection of food pathogens, researchers developed a new method that allows for faster bacterial enrichment. The method holds promise for improving pathogen prevention and control in large-volume poultry processing samples.

**INDIVIDUAL BIRD MONITORING TECHNOLOGIES**
The advanced imaging and sensors group explored commercial off-the-shelf sensors to lay the framework for designing a prototype device that can be used for measuring individual bird bio-responses. The measurements could be used to assess the bird’s well-being during various live operations.
TECHNICAL ASSISTANCE

ATRP staff provided 31 technical assists to companies and individuals in the poultry industry across the state. These assists included simple inquiries regarding information or help needed to address a problem and extensive on-site consultations in which researchers collected data and provided a full report on their findings and recommendations. ATRP uses input from all assists to gauge situations calling for new research initiatives.

PROJECT COLLABORATORS

Industrial collaborators support research projects by providing industry expertise and access to facilities for data collection and systems testing and contributing in-kind and cash support on an “as needed” basis. Academic partners collaborate with research teams by providing cross-disciplinary expertise and experience as well as access to university research facilities.

Auburn University
  Department of Poultry Science
Fieldale Farms
Georgia Institute of Technology
  School of Biology
  School of Biomedical Engineering
  School of Chemistry and Biochemistry
  School of Chemical and Biomolecular Engineering
  School of Civil and Environmental Engineering
  School of Electrical and Computer Engineering
  School of Mechanical Engineering
Harrison Poultry
Ice Synergy
Mar-Jac Poultry
Neogen
Perdue Farms
Southern Company Services
University of Georgia
  Department of Poultry Science
  Poultry Diagnostic and Research Center
USDA-ARS Richard B. Russell Research Center
U.S. Poultry & Egg Association

TECHNOLOGY TRANSFER AND OUTREACH ACTIVITIES

Three issues of ATRP’s PoultryTech newsletter were published in FY 2015, with several articles reprinted in the trade press. The Monitoring Bird Well-being in Broiler Housing Using Audio research project was the focus of a front-page article in The Wall Street Journal and a radio segment on NPR’s “All Things Considered.” Research staff also generated more than 40 articles and technical presentations and filed two provisional patents and three invention disclosures.

ATRP exhibited at the International Production & Processing Expo, Georgia Ag Week Kick-off Celebration, and the Georgia Poultry Federation’s Spring Meeting and annual Night of Knights fundraiser. Together with the U.S. Poultry & Egg Association, ATRP co-hosted the annual National Safety Conference for the Poultry Industry.

ATRP also helped coordinate a staff of more than 150 volunteers for the Poultry World educational exhibit at the Georgia National Fair.

CATEGORIES

- AUTOMATION: 3
- ENVIRONMENTAL: 17
- FOOD SAFETY: 4
- WORKER SAFETY: 3
- IT & SENSORS: 1
- OTHER: 3

TO LEARN MORE ABOUT ANY OF THESE PROJECTS AND OTHER RESEARCH WORK, PLEASE VISIT WWW.ATRP.GATECH.EDU
ADVISORY COMMITTEE

The Agricultural Technology Research Program is conducted in cooperation with the Georgia Poultry Federation with input from an external Advisory Committee consisting of representatives from leading poultry companies and allied organizations.

MEMBERS

Wally Hunter, Perdue Farms (Chair)  
Jonathan Green, American Proteins  
Mikell Fries, Claxton Poultry  
Steve Snyder, Claxton Poultry  
Bill Crider, Coastal Meats  
Charlie Westbrook, Cobb-Vantress  
Phillip Rehberg, Crider Poultry  
John Wright, Fieldale Farms  
Alan Habegger, First Fresh Foods  
Joe Cowman, Gainco  
John Daley, Gainco  
Carolyn Tynan, Georgia Power  
Kelly Horne, Griffin Industries  
David Bleth, Harrison Poultry  
Bob Dowdy, Keystone Foods  
Einar Einarsson, Mare-Stork Poultry Processing  
Doyle Milligan, Mare-Stork Poultry Processing  
Chad Ware, Mare-Stork Poultry Processing  
John Weeks, Mar-Jac Poultry  
Joel Williams, Mar-Jac Poultry  
Roger Huezo, Meyn Equipment  
Heath Jarrett, Meyn Equipment  
Ken Long, Pilgrim’s  
Michael Ormsby, Pilgrim’s  
Lonnie Wiggins, Pilgrim’s  
Jim Bowling, Prime Equipment Group  
Mike Gasbarro, Prime Equipment Group  
Greg Nichols, ProView Foods  
Henry Troutman, ProView Foods  
Lisa Blotsky, Tyson Foods  
Steve Schimweg, Tyson Foods  
Steve Wilson, Tyson Foods  
Aaron Leach, Wayne Farms  
Bryan Miller, Wayne Farms  
Ron Rogers, Wayne Farms

ADVISORS

Mike Giles, Georgia Poultry Federation  
Abit Massey, Georgia Poultry Federation  
Louise Dufour-Zavala, Georgia Poultry Laboratory Network  
Mike Lacy, University of Georgia  
John Glisson, USPOULTRY  
Harold E. Ford Foundation

OUR MISSION

To promote the economic growth of Georgia agribusiness (especially the poultry industry) through:

- Research focused on the development of new technologies that improve productivity and efficiency
- Exposure of students to the challenges of developing and adapting these technologies
- Technical assistance to Georgia-based industry members with special problems
- Release of information on emerging technologies and improved operational management through newsletters, articles, seminars, and presentations to speed ultimate commercial use

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