

Georgia Tech Research Institute  
Agricultural Technology  
Research Program

**2024**

# ANNUAL REPORT

TRANSFORMING POULTRY, AGRIBUSINESS, AND FOOD MANUFACTURING  
THROUGH ADVANCED TECHNOLOGIES

# MESSAGE FROM THE PROGRAM MANAGER

**Doug Britton, Ph.D., ATRP Program Manager**



I am pleased to share with you the Agricultural Technology Research Program's (ATRP) 2024 Annual Report. This report highlights a few of our multidisciplinary research projects that are addressing challenges facing the agriculture industry from poultry growout houses and processing plant operations to row crops. Research is also focused on future concepts that envision next-generation systems to address complex challenges facing the food production system. I am proud of our progress over the past year, and look forward to our continued success as we work together with you to transform poultry, agribusiness, and food manufacturing through advanced technologies.

## RESEARCH HIGHLIGHTS

### AUTOMATION & ROBOTICS

#### Poultry House Robotics

Researchers are investigating the use of a ground robot to autonomously perform broiler and broiler breeder rearing and management tasks in poultry houses. These tasks include mortality collection, egg picking in breeder operations, as well as environmental and animal health monitoring, each currently conducted with a significant amount of manual labor. Recent field tests in commercial broiler breeder houses demonstrated a more than 90 percent accuracy rate in egg-picking tasks. Robotic systems have the potential to allow growout managers to collect data for decision support and perform tasks that can reduce labor while potentially mitigating disease and contamination factors.



#### > One-Handed Rehang Device

Designing a mechanical system to help lift/rehang chicken carcasses onto moving shackles after chilling that reduces the necessary exertion of workers.

### ENVIRONMENTAL & BIOLOGICAL SYSTEMS

#### PAA Decay Kinetics

Peracetic acid (PAA) is used as a food safety measure for microbial control in poultry carcass chilling operations. While it is an effective antimicrobial, it suffers one drawback — its decay kinetics that lead to varying concentration levels throughout the processing day. Researchers are conducting studies to quantify factors that primarily lead to the accelerated decay of PAA in chiller water under a variety of conditions. Recent results have shown that chemical formulations and incoming water quality play an important role in PAA stability. It was found that high organic loads, high temperature, and sonication have a negative impact on PAA stability. A full understanding of PAA decay kinetics in chilling operations will allow processors to optimize water reuse and lower the amount of PAA needed for microbial control.



#### ADDITIONAL AUTOMATION & ROBOTICS PROJECTS:

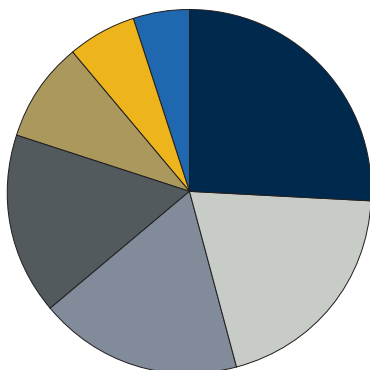
- > **Action-Centric Learning for Closed-Loop Manipulation**  
Applying artificial intelligence (AI) and learning from demonstration approaches to train robots to manipulate products in poultry processing tasks.
- > **Advanced Intelligent Cutting**  
Automating bird front-half shoulder deboning with a robotic cutting system that rivals human performance.
- > **Virtual Reality for Robotics System Control and Tasking**  
Using virtual reality (VR) to enable human-robot collaboration for performing poultry processing tasks from a remote location.
- > **Powered Device for Targeted Trimming of Poultry**  
Increasing yield in chicken breast deboning operations with a novel cutting device that eliminates excess trimming.

#### ADDITIONAL ENVIRONMENTAL & BIOLOGICAL SYSTEMS PROJECTS:

- > **Enhanced Chilling Automation via Directed Motion**  
Achieving higher thermal cooling and antimicrobial efficacy in poultry chillers with an immersive in-line system that uses an optimized rotational pattern to spin each poultry carcass individually on shackles as it moves through the chiller water.

## ATRP BY THE NUMBERS | FY 2024 (July 1, 2023 – June 30, 2024)

Financial Statement — Total State of Georgia funding allocated for ATRP research: **\$2,370,327**



Automation and Robotics	26%
Environmental & Biological Systems	20%
Imaging & Sensing	18%
Technology Transfer/Outreach/Technical Assistance	16%
Program Support	9%
Row Crops	6%
Future Concepts	5%



## IMAGING & SENSING

### Integrated Management of Poultry Processing Waters

The concentration of antimicrobials, particularly PAA (peracetic acid), in poultry processing waters is monitored constantly to ensure efficacy. Unfortunately, current monitoring practices require manual sample collection and measurement. Researchers have developed an optical sensor that provides automated real-time monitoring of PAA in chiller water. Recent field trials at a local poultry processing plant demonstrated the sensor's accuracy and robustness, proving its utility as a tool for plants to more efficiently manage PAA dosing. The technology has been licensed for commercialization.



### ADDITIONAL IMAGING & SENSING PROJECTS:

#### > Non-Destructive Egg Fertilization Detection via VOCs

Using gas chromatography mass spectrometry (GC-MS) to capture volatile organic compounds (VOCs) from eggs to improve overall hatch rates by providing earlier fertility detection.

#### > 3D X-Ray Reconstruction

Exploring the use of X-ray images to construct a solid 3D model of a bird skeleton to train a robotic knife to perform deboning cutting paths that avoid bone chips to maximize yield.

#### > Multi-Mycotoxin Detection in Poultry Feed

Investigating the use of volatile organic compounds (VOCs) for earlier detection of mycotoxins in poultry feed to improve poultry health and reproduction rates.

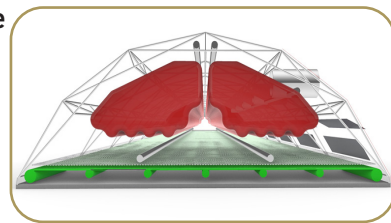
#### > mVOC Egg Contamination Detection

Identifying common microbial volatile organic compounds (mVOCs) released from fungi and bacteria from broiler eggs during incubation to improve hatch rates.

## FUTURE CONCEPTS

### Poultry House of the Future

Researchers are designing a next-generation poultry house through a systems engineering approach that integrates modeling, structural design, behavioral modeling, and operational requirements. The design concept is focused on removing waste through an innovative flooring system, optimizing the volume of conditioned air in the house through an inflatable roofing system, and minimizing power demand from the grid through on-site energy generation.



### ADDITIONAL FUTURE CONCEPTS PROJECTS:

#### > On-Farm Processing and Transport (FPaT)

Alleviating transportation-related bird welfare concerns and associated labor requirements and transportation costs with an on-farm processing and transport system that transports carcasses instead of live birds to poultry processing plants.

## ROW CROPS

### Utilizing Peanut Volatile Organic Compounds to Detect *Aspergillus* in Peanut Plants, Pods, and Kernels

Researchers are exploring the capture of volatile organic compounds (VOCs) from peanuts to detect aflatoxin, a toxin generated from the fungus, *Aspergillus*, which costs peanut growers millions annually.



## THANKS TO OUR PARTNERS

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. University and agency partners collaborate with research teams by providing cross-disciplinary expertise and experience as well as access to research facilities and resources.

Auburn University-Department of Poultry Science • Aviagen • Fieldale Farms • Georgia Research Alliance  
Georgia Tech School of Interactive Computing • Harrison Poultry • Mar-Jac Poultry • OXOS • Perdue Farms • Pilgrim's  
Salvus • Stäubli • University of Florida-Agronomy Department • University of Georgia-Department of Poultry Science &  
Department of Horticulture • USDA-ARS U.S. National Poultry Research Center • Wayne-Sanderson Farms



**6** research prototypes in various stages of development



**5** patent applications & **1** licensing agreement



**33** published articles, papers, and presentations



**16** partners collaborating on one or more projects



**10** technical assistance service requests fulfilled

ATRP also participates in outreach activities, including co-hosting the National Safety Conference for the Poultry Industry with the U.S. Poultry & Egg Association, publishing the PoultryTech newsletter, and exhibiting at the International Production and Processing Expo (IPPE) and Poultry World at the Georgia National Fair.



# Georgia Tech Research Institute Agricultural Technology Research Program



## ATRP ADVISORY COMMITTEE | FY 2024 (July 1, 2023 – June 30, 2024)

ATRP 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

Jonathan Green, Perdue Farms (Chair)  
 Matt Nelson, Boehringer Ingelheim  
 Randy Segars, Boehringer Ingelheim  
 Robert Dirksen, Cantrell-Gainco Group  
 Chris Gates, Cantrell-Gainco Group  
 Brian Porter, Cantrell-Gainco Group  
 Steve Snyder, Claxton Poultry  
 Mark Hamby, Cobb-Vantress  
 William Herring, Cobb-Vantress  
 Bill Crider, Crider Foods  
 Kelly Horne, Darling Ingredients  
 Terry Paschall, Darling Ingredients  
 David Walker, Darling Ingredients  
 Ken Martin, Fieldale Farms  
 John Wright, Fieldale Farms  
 Paul Breure, Foodmate  
 Roger Huezo, Foodmate  
 Jim James, Foodmate  
 Jason Bragg, Georgia EMC  
 Jordan Allison, Harrison Poultry  
 Humberto Hernandez, JBT FoodTech  
 Jon Hocker, JBT FoodTech  
 Joe Gasbarro, JBT-Prime Equipment Group  
 Cezary Mroz, JBT-Prime Equipment Group  
 Kirk Reis, JBT-Prime Equipment Group  
 David Sewell, Koch Foods  
 Matt Brass, Marel

Luke Pollock, Marel  
 Phillip Turner, Mar-Jac Poultry  
 John Weeks, Mar-Jac Poultry  
 David Marsh, Meyn  
 Mike Bell, MP Equipment  
 Tom Van Doorn, MP Equipment  
 Tim Little, Perdue Farms  
 Damon Simpson, Perdue Farms  
 Lucas Hill, Pilgrim's  
 Adam Willis, Pilgrim's  
 Andre Tatar, Salvus  
 Derrick Arp, Simmons Engineering Company  
 Mike Rhodes, Southern Company  
 Drew Stewart, Southern Company  
 Terry Bruce, Tip Top Poultry  
 Anthony Doss, Tyson Foods  
 Chetan Kapoor, Tyson Foods  
 Steve Schimweg, Tyson Foods  
 Juanfra DeVillena, Wayne-Sanderson Farms  
 Dwayne Holifield, Wayne-Sanderson Farms

### ADVISORS

Mike Giles, Georgia Poultry Federation  
 Abit Massey, Georgia Poultry Federation  
 Louise Dufour-Zavala, Georgia Poultry Laboratory Network  
 Todd Applegate, University of Georgia  
 Denise Heard, U.S. Poultry & Egg Association

## CONNECT WITH ATRP



**ON THE WEB**  
ATRP.gatech.edu



**FACEBOOK**  
facebook.com/ATRP.GTRI



**LINKEDIN**  
tinyurl.com/ATRPresearch



**YOUTUBE**  
youtube.com/@GTRI-ISTD



**E-MAIL OR PHONE**  
ATRP@gtri.gatech.edu | 404.407.8812



To sign up for ATRP's *PoultryTech* newsletter, visit [atrp.gatech.edu/subscribe](http://atrp.gatech.edu/subscribe) or scan the QR code.

