ENGINEERING TOMORROW'S POULTRY INDUSTRY

PoultryTech

VOLUME 36 NUMBER 1 SPRING 2024

External Funding Expands ATRP's Research Portfolio, Boosting Its Return on Investment

The Agricultural Technology Research Program (ATRP) is the Georgia Tech Research Institute's oldest state-funded research program, receiving more than $2 million annually to conduct research vital to Georgia's poultry, agribusiness, and food manufacturing sectors.

With guidance from industry advisors, the program allocates the funding across basic and applied research projects, outreach and education programs, and technical assistance services.

While good stewardship of state dollars is foremost, researchers also seek to build on that investment by attracting external funding through federally funded research grants and industry funding opportunities.

Over the past year, ATRP researchers have secured more than $2 million in additional funding, helping to expand the program's research portfolio while boosting its return on investment.

ATRP researchers have secured more than $2 million in additional funding over the past year from federally funded research grants and industry funded projects. The awards are helping to expand the program's research portfolio while boosting its return on investment.

Pictured front to back: Jie Xu, Stephanie Richter, Judy Song, Colin Usher, Ai-Ping Hu, Comas Haynes, and Alex Samoylov.

U.S. Department of Agriculture, Agricultural Research Service (USDA-ARS) Cooperative Program
Poultry Processing Research and Innovation

Working with partners in the USDA-ARS Quality and Safety Assessment Research Unit at the U.S. National Poultry Research Center in Athens, Georgia, ATRP researchers are developing alternative poultry processing approaches to improve sustainability and efficiency while maintaining product safety and quality.

Three projects originally funded through ATRP have tie-ins to key objectives of the program and will now receive funding through it. The three objectives are to explore alternative primary poultry processing approaches, develop advanced chilling strategies, and design novel sensing technologies for chiller management.

The respective ATRP projects are On-Farm Processing and Transport (FPaT), led by Principal Research Scientist Alex Samoylov, Ph.D.; Enhanced Chilling Automation Via Alternative Media and Motion, led by Principal Research Engineer Comas Haynes, Ph.D.; and Integrated Water Management System, led by Principal Research Scientist Jie Xu, Ph.D.

continued on page 2

IN THIS ISSUE

External Funding Expands ATRP's Research Portfolio, Boosting Its Return on Investment

continued from page 1

U.S. Department of Agriculture, National Institute of Food and Agriculture (USDA-NIFA) Joint Center
Center for Scalable and Intelligent Automation in Poultry Processing

ATRP researchers together with colleagues at the University of Arkansas, Fort Valley State University, and the University of Nebraska are aiming to adapt robotic automation to the poultry processing industry.

ATRP researchers will spearhead studies to develop scalable poultry manufacturing, particularly lot size of one for robotic processing of chicken carcasses. Additional work will focus on using virtual reality tools to train robots to perform poultry processing tasks ultimately leading to workforce transformation. Principal Research Engineer Ai-Ping Hu, Ph.D., and Senior Research Engineer Konrad Ahlin, Ph.D., are leading the ATRP team's work.

National Science Foundation (NSF) Convergence Accelerator
AI-Driven Smart Low-Cost Ammonia Sensor (AI-SLAMS)

ATRP researchers are part of an interdisciplinary team investigating a smart poultry farm ammonia monitoring system. Led by Senior Research Engineer Judy Song, Ph.D., the team brings together insights and advances in chemical sensing, material science/nanotechnology, poultry science, manufacturing, AI, and data science. Co-principal investigators include Doug Britton, Ph.D., ATRP; Brian Fairchild, Ph.D., Department of Poultry Science, University of Georgia; and Jianjun Shi, Ph.D., and Chuck Zhang, Ph.D., H. Milton Stewart School of Industrial and Systems Engineering at Georgia Tech.

AI-SLAMS aims to provide poultry farmers with an affordable, reliable, and consistent way to measure ammonia concentrations in growout houses. This will not only help ensure the welfare of the birds being raised, but also support worker safety on the farm.

The NSF Convergence Accelerator program is designed to support research teams that are working to solve grand challenges at the intersection of multiple scientific and engineering fields.

"Securing external dollars not only helps to solidify ATRP's reputation in the AgTech research arena, but shows our commitment to providing the state of Georgia a healthy ROI for its support of the program. It also enables our research teams to expand their research portfolios while cultivating relationships with industry, academic, and federal partners, which is critical to driving transformational AgTech innovations."

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

The AI-SLAMS project is one of 16 projects selected during Phase 1 of the program, which is focused on developing novel technologies and solutions to challenges posed by hazardous chemicals.

Cobb Research Initiative

The Cobb Research Initiative (CRI) is a research grant program of Cobb-Vantress, LLC, a leading poultry genetics company. The CRI was developed to help propel poultry genetics further by creating opportunities that bring together diverse scientific research disciplines to create advancements in global protein production.

The funded projects are two of nine selected during Phase 1 of the CRI, which solicited proposals that promote the convergence of science, automation, data, and technology to advance poultry genetics, health, welfare, and production efficiency.

BBAI: Broiler Breeder Development Modeling and Anomaly Identification Based on Automated CT Scan Analysis

The BBAI project, led by Stephanie Richter, research scientist II, aims to address broiler breeder livability issues and improve health and welfare outcomes. Working with Cobb specialists, the team is developing approaches that enable quicker isolation of diseased birds from imaging scans using AI machine learning.

High Fidelity Data Collection and Analytics for Enhanced Broiler Breeder Livability

Colin Usher, senior research scientist, is leading a team exploring the use of high-resolution cameras, 3D sensors, and audio for characterizing broiler breeder status. Analysis techniques include signal processing, image analysis, and artificial intelligence. In particular, attempts will be made to characterize bird gait in video streams, and provide early detection of multiple ailments including coccidiosis and ascites.

"Securing external dollars not only helps to solidify ATRP's reputation in the AgTech research arena, but shows our commitment to providing the state of Georgia a healthy ROI for its support of the program," says Doug Britton, Ph.D., ATRP program manager. "It also enables our research teams to expand their research portfolios while cultivating relationships with industry, academic, and federal partners, which is critical to driving transformational AgTech innovations."

MANAGER'S CORNER

One of the strengths of the Agricultural Technology Research Program (ATRP) is the diversity of skill sets and disciplines that our people possess to address the research challenges in the industry. As you will see in this issue's front-page article, our ATRP researchers have been extremely successful at leveraging these diverse skills to recruit additional resources from the National Science Foundation, the U.S. Department of Agriculture, and Industry to further the impact of our research in poultry and agriculture. ATRP has been the foundation that has allowed our research faculty to develop these technical and scientific capabilities and positioned us for success on the larger research stage. ATRP is extremely proud of the work that all of our researchers do, and we are always excited to highlight these additional successes that extend our impact even further.

I'd like to highlight two important upcoming ATRP-supported events specifically tailored for the poultry, food, and agriculture industries. First is the National Safety Conference for the Poultry Industry that brings together worker safety professionals from all over the country to discuss current trends and new approaches for keeping our people safe in the workplace (see page 5 for registration information). Second is the International Food Automation Networking (IFAN) Conference that convenes industry leaders from across the globe for two days of education sessions and networking opportunities around robotics, automation, artificial intelligence, and advanced sensing (see below for registration information).

We recently lost a wonderful friend and champion of the ATRP program, Abit Massey, president emeritus of the Georgia Poultry Federation (see tribute article on page 7). Abit was instrumental in ATRP's founding in 1973 and its most committed supporter, advocating for the program at the State Capitol and attending countless ATRP Advisory Committee meetings where he helped to guide the program's research agenda focused on industry priorities. We will continue to honor his contributions to ATRP through the Abit Massey Student Internship Program, and the F. Abit Massey Champion Award, which was established last year at our 50th Anniversary Celebration. We will miss his ever-present smile and kind words of encouragement. Our heartfelt condolences are offered to the Massey family.

Doug Britton, Ph.D.
ATRP Program Manager

International Food Automaton Networking (IFAN) Conference

Securing the Future: Designing Robustness and Resilience into the Food Production System

September 9-10, 2024
Georgia Tech Hotel and Conference Center – Atlanta, Georgia

Targeted toward corporate food manufacturing engineering leaders, equipment suppliers, and end customers of such technologies, the IFAN conference seeks to provide meaningful networking opportunities, highlight tangible research and development activities, and provide broader context for automation deployment in the food manufacturing sector.

REGISTER NOW at **ifan.gtri.gatech.edu**

RESEARCH Q&A

mVOContamination: Egg Incubation Microbial VOC Detection

Stephanie Richter, research scientist II, and Christopher Heist, Ph.D., research scientist II and R. Harold and Patsy Harrison Research Faculty Fellow in Poultry Technologies, discuss their exploratory research project "mVOContamination: Egg Incubation Microbial VOC Detection." The project seeks to identify common microbial volatile organic compounds (mVOCs) released from fungi and bacteria in broiler eggs during incubation. Removing contaminated eggs before incubation greatly reduces the risk of transfer to other eggs or the entire incubator.

Q: What industrial challenge is the project addressing?
A: Hatcheries incubate fertile eggs to produce high-quality chicks. Hatcheries encounter issues when eggs become contaminated with bacteria and/or mold. Improper storage of eggs can cause moisture to accumulate on the shell surface and allow organisms to move through eggshell pores. Our research collects VOCs from eggs to monitor for known pathogens. The goal is to detect contamination before pathogen concentrations reach the point of "oozers and exploders" and reduce cross contamination potential to surrounding eggs.

Q: What is the project's approach and how is it different from current practice?
A: Typical approaches to detect or determine contaminated eggs use candling and breakout analysis of unhatched eggs. Other times, eggs themselves let you know they are contaminated by exploding in the incubator! We collect VOCs from individual eggs and analyze for key compounds related to pathogens of concern. We can sample for VOCs at any point before and during incubation for enhanced monitoring. Identifying contamination earlier can reduce spread of pathogens to other eggs in the incubator.

Stephanie Richter, project co-director, collects microbiological samples from an experiment's breakout analysis. Ritcher is sampling Salmonella, which some groups were infected with before incubation. The microbiology results will be compared to VOC profiles collected from corresponding eggs during incubation.

Q: What has been the most challenging and/or rewarding aspect of working on the project thus far?
A: Our research focuses on detecting contamination during incubation. Our test eggs need to be fertile to determine the bacterial detection threshold during incubation. We have to assume the eggs are fertile but do not know until breakout analysis happens. During breakout, we examine the eggs for fertility/infertility of the germinal disc, chick development stage, interesting smells, and yolk color. In one experiment, less than half the eggs were fertile. We have learned to have steady hands! Chris is an ace at dremelling a small hole into the eggshell without piercing through the shell membrane.

Q: What are the results to date?
A: Promising! We inoculate each egg's yolk or albumen with either a control (phosphate buffered saline (PBS)) or *Salmonella* in PBS using a 30 gauge syringe. Inoculation is followed by the start of incubation on day 0 with breakout analysis conducted at day 13. The results align with compounds associated with *Salmonella* in published research. VOCs were detected at low concentrations of bacteria when inoculating inside the albumen. The VOCs have been able to distinguish between internal and external contamination of eggs for *Salmonella*.

Q: What are the project's next steps and long-term goals?
A: We are trying to determine if there are different VOCs for yolk versus albumen contamination. After challenging with *Salmonella,* we will begin infecting with *Aspergillus*. Our next studies will contaminate the yolk, albumen, and external surface. We will sample and analyze VOCs to understand if there are different VOCs depending on the infection site. Long-term we would like to develop a sensing technology to detect the special VOC cocktail, which is associated with pathogens of concern.

Q: What are the potential benefits for poultry processors?
A: We want to help increase hatchability rates and profitability. Our detection methods allow for faster removal of contaminated eggs and can help to validate sanitation programs. They also enhance animal welfare and biosecurity, while helping to create healthier generational stock.

Q: Is there anything else you would like to add?
A: We would like to thank our project collaborators, Dr. Jeanna Wilson with the University of Georgia for her hatchery expertise, and Dr. Caitlin Harris with USDA-ARS for her microbiology inoculation guidance.

RESEARCHER PROFILE

Parth Mandrekar

Job title: Research Engineer I

Education: B.S., Mechanical Engineering & M.S., Mechanical Engineering – Georgia Institute of Technology

Areas of research expertise: Mechanical Engineering, Controls, Robotics, Mechatronics, and Computer Aided Design

List of any poultry industry projects you're working on and your role: I provide mechanical engineering support and concept development for three projects: Integrated Water Management System (PAA Sensing), Poultry Farm of the Future, On-Farm Processing and Transport (FPaT).

What I find most rewarding about working on poultry industry projects: I'm grateful for the ability to foster change for all of the individuals involved with poultry production from the farmers to the workers at processing plants to the consumers. Our work also has the ability to improve bird welfare within the houses and transportation to the processing plant. I am excited to continue working on my projects and am eager to see how our work can impact the poultry industry in the upcoming years.

A talent I wish I had: Juggling with my eyes closed

Another occupation I'd like to try: Professional golfer

My first job: My first job was a robotics summer camp counselor at a YWCA camp. I designed challenges for students and taught them how to build robots using lego Mindstorms to complete the tasks.

If I could meet someone famous, who would it be and why: I would love to meet Rafael Nadal. He is a tennis icon and my favorite player of all time. I think his tenacity and mental fortitude transcended the game and was truly inspirational.

One thing people may not know about me: I got my first degree blackbelt in karate when I was younger!

My day would not be complete without: A great meal and time spent with some friends!

The last book I read: *The Wise Man's Fear* by Patrick Rothfuss

The last movie I saw: The Lord of the Rings: The Return of the King

My favorite song: "Snow" by Red Hot Chili Peppers

My motto: "It is in your hands to create a better world for all who live in it." – Nelson Mandela

My hobbies: Rock climbing, tennis, pickleball, trivia, baking, cooking

— SAVE THE DATE —

NATIONAL SAFETY CONFERENCE FOR THE POULTRY INDUSTRY

August 19-21, 2024
Hilton Sandestin Beach Golf Resort & Spa
Destin, Florida

The 2024 National Safety Conference for the Poultry Industry is designed specifically for poultry facility and corporate safety personnel. The three-day event features key presentations on important industry topics and updates on government policy. Other highlights include breakout sessions for discussing best practices and current challenges, as well as networking and knowledge exchange opportunities with other safety and health professionals.

To register, visit **uspoultry.org/programs/education/seminar**

RESEARCH BRIEF

Powered Device for Targeted Trimming of Poultry

Can a semi-automated device help poultry deboners make more targeted trimmings in breast meat? Researchers with the Georgia Tech Research Institute's Agricultural Technology Research Program (ATRP) are attempting to answer that question.

"Current automated machines leave cartilage and bone on the breast prior to trimming. We are exploring ways to increase overall yield and reduce labor in deboned chicken breast trimming operations," says Sean Thomas, principal research technologist and project director.

Thomas and a team of researchers have designed a prototype semi-automated trimming device. The patent-pending tool is lightweight and ergonomically designed to assist workers with removing unwanted cartilage, bone, and fat from breasts while reducing excess trimming, thus increasing overall yield. Vacuum power removes product trimmings that can then be placed in an adjacent container.

Aklilu Giorges, principal research engineer, conducts tests on butterfly chicken breast fillets using the semi-automated trimming device. The patent-pending tool is lightweight and ergonomically designed to assist poultry plant workers with removing unwanted cartilage, bone, and fat from chicken breasts while reducing excess trimming, thus increasing overall yield.

Recent yield studies found the device's trimming mechanism removed less usable product while still targeting unwanted cartilage, bone, and fat. During testing, 12 breast butterflies were harvested from front halves, and experiments were conducted using a rotating tool and a manual knife.

Conclusions

▶Average Trimming Time for Wishbones and Cartilages

Rotating Tool: 9.22s (wishbones) and 9.51s (cartilages)
Manual Knife: 15.7s (wishbones) and 16.2s (cartilages)

▶Average Weight of the Lost Meat on Wishbones and Cartilages

Rotating Tool: 4.89g (wishbones) and 5.38g (cartilages)
Manual Knife: 5.60g (wishbones) and 7.93g (cartilages)

▶Overall Trimming Time

Significantly shorter when using the rotating tool for wishbones and cartilages.

▶Overall Mass (Yield) Losses

Rotating tool reduced losses from cartilage trimming by 2.56g on average.

No significant difference in mass losses between the two trimming methods for wishbones.

Samples

Cutting Systems

Rotating Tool

Manual Knife

IN MEMORIAM

Remembering Abit Massey

Georgia Poultry Industry Icon and ATRP Champion

Abit Massey, president emeritus of the Georgia Poultry Federation and one of the state's most effective lobbyists, passed away peacefully on June 14 at the age of 96.

While known across the state of Georgia for his legendary impact on agricultural and poultry industry issues, he is best known at Georgia Tech for the pivotal role he played in the creation of the Georgia Tech Research Institute's (GTRI) Agricultural Technology Research Program (ATRP).

In the early 1970s, as Massey fondly recalled on many occasions, he received an inquiry about a noise problem in a poultry processing plant through his role with the Georgia Poultry Federation. At the time, he was also serving on a Board of Regents committee that had set up a service enabling citizens with a need to call one number and be referred to an expert in the University System of Georgia. He thought the inquiry was the perfect opportunity to test the new referral system. So, he called the number in the morning and by the afternoon a meeting had been set up with Georgia Tech.

That phone call and subsequent meeting led to a decades-long relationship with Massey. He lobbied the Georgia General Assembly for the first $100,000 appropriation to involve Georgia Tech in studies supporting the poultry industry. Over the next 50 years, with his ongoing advocacy, the program's annual appropriation grew year after year, and now tops $2 million.

"Abit Massey was one of a kind — a spirited and enthusiastic supporter of Georgia Tech who used his career to strengthen our economy, drive agricultural and industrial innovation, and feed millions of people," said Ángel Cabrera, president of Georgia Tech. "Thanks to his leadership, Georgia Tech's Agricultural Technology Research Program has spent decades applying the latest scientific advances to our state's agricultural industry, which has helped make Georgia farms safer, more efficient, more productive, and more sustainable. His life embodied Tech's motto of Progress and Service, and he will be sorely missed."

Additionally, he was a constant advisor and partnership-builder, connecting ATRP researchers with representatives from leading poultry companies and allied organizations, establishing a strong ATRP Industry Advisory Committee that meets annually to help guide the program's research agenda. This public-private partnership is recognized as one of the leading programs of its kind in the country, where university researchers work together with industry partners to develop new technologies and adapt existing ones for specialized industrial needs.

He also took time to inspire future poultry industry leaders. Each spring, when he would attend an advisory committee meeting, he particularly enjoyed meeting and engaging with students. In 2019, ATRP established the Abit Massey Student Internship Program in his honor. The goal of the program is to prepare the next generation of researchers and professionals to innovatively tackle the challenges of building the poultry plant of the future.

Massey, a University of Georgia (UGA) alumnus, was also key to strengthening collaborations between Georgia Tech and UGA. As the state's leading engineering university and leading land-grant institution, respectively, the duo worked on projects over the years that helped drive innovation in the agricultural sector by combining engineering knowledge with poultry science expertise.

His steadfast dedication to ATRP cements his legacy as the program's true champion. In April 2023 at ATRP's 50th Anniversary Celebration, he was presented with the first F. Abit Massey Champion Award in appreciation of his unwavering support and commitment to the development and sustainment of ATRP. Going forward the namesake award will be presented to an individual who exemplifies the spirit of Massey by going above and beyond in support of ATRP.

continued on page 8

Remembering Abit Massey, Georgia Poultry Industry Icon and ATRP Champion

continued from page 7

"Mr. Massey graciously leveraged his connections and influence to both found and then actively champion the Agricultural Technology Research Program at Georgia Tech. We are extremely grateful for all that he did for ATRP and the agriculture and poultry industries in Georgia. He was one-of-a-kind, a truly very special person and a real modern-day gentleman," said Doug Britton, ATRP program manager.

"We will forever be grateful for Abit's contributions to GTRI and ATRP and will ensure his commitment to educating the next generation of poultry leaders continues through the Abit Massey Student Internship Program. His charm, wit, welcoming nature, and guidance will be deeply missed," said Jim Hudgens, GTRI director.

Massey received numerous awards and commendations, including being the only UGA graduate to receive a Presidential Citation for Distinguished Service from Georgia Tech. Awarded in 2009, the citation in part recognized Massey's championing of university research and outreach, and the role it can play in promoting economic development in the state. Other notable contributions to Georgia Tech include helping to secure public and private funding for GTRI's Food Processing Technology Building, assisting with the expansion of the Enterprise Innovation Institute's regional field office network, and serving on various Institute advisory boards.

To hear Massey's recollections of the growth of Georgia's poultry industry and his history with ATRP, listen to Episode 3 of the Georgia Tech Research Podcast series commemorating ATRP's 50th Anniversary at gtri.gatech.edu/podcast/atrp-e3-abit-massey.

Technical Assistance Is Just a Phone Call Away

The Agricultural Technology Research Program (ATRP) provides no-cost technical assistance to Georgia-based firms and individuals in the poultry industry.

These assists range from simple inquiries regarding information or help needed to address a problem to extensive on-site consultations in which researchers collect data and provide a report on their findings and recommendations.

The program also offers in-plant energy usage/cost assessments and workplace safety evaluations.

To inquire about the program or to schedule an assist, call ATRP Program Manager Doug Britton at 404-407-8829 or email him at doug.britton@gtri.gatech.edu.

Like Us on Facebook

ATRP's Facebook page features information about exciting research initiatives underway, interesting poultry and food industry news, industry events, photos, videos, and more!

facebook.com/ATRP.GTRI

PoultryTech

Published by the Agricultural Technology Research Program of the Georgia Tech Research Institute, a program conducted in cooperation with the Georgia Poultry Federation with funding from the Georgia Legislature.

Agricultural Technology Research Program
GTRI/ATAS/ISTD
Atlanta, GA 30332-0823

Phone: 404-407-8812
FAX: 404-407-8569

Angela Colar
Editor
angela.colar@gtri.gatech.edu

Doug Britton, Ph.D.
ATRP Manager/Editorial Adviser
doug.britton@gtri.gatech.edu

Online:
atrp.gatech.edu

***PoultryTech* is published twice a year (Spring and Fall) and delivered free of charge to subscribers. To subscribe, visit atrp.gatech.edu/subscribe or scan our QR code.**