ENGINEERING TOMORROW'S POULTRY INDUSTRY

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Reimagining Poultry Farming: Researchers Design Next-Generation Poultry Housing System

"It is time to rethink the poultry house to incorporate best bird well-being practices and design it for automation now and into the future," says Alex Samoylov.

Samoylov is a principal research scientist at the Georgia Tech Research Institute (GTRI) and project director of the novel "Poultry House of the Future" project, which is funded through GTRI's Agricultural Technology Research Program (ATRP).

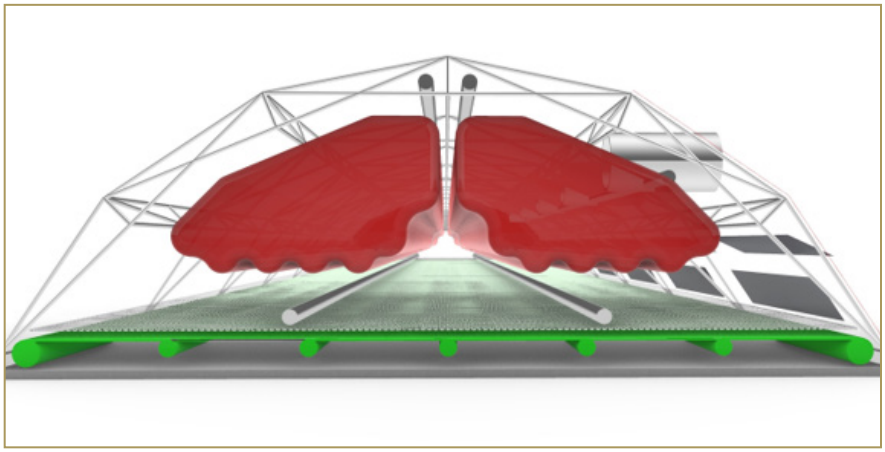

Illustration of the Poultry House of the Future. The design of next-generation poultry housing systems is crucial for establishing the internal environmental conditions needed for optimal bird health and productivity. The Poultry House of the Future focuses on removing waste through an innovative flooring system (BHIG-MESS) and optimizing the volume of conditioned air in the house through an inflatable roofing system (known as the "Chicken Bubble").

In the United States, there are more than 200,000 poultry farms, which contain nearly one million poultry houses. A typical poultry house is 50 feet wide, 500 feet long, and usually 8 feet high or taller, depending on the design. These houses are often constructed similarly and use industrial variable-speed fans to control environmental factors and manage odors. Samoylov explains that poultry growers face three significant daily challenges — temperature, odor, and moisture — each of which can impact bird well-being, health, and growth rates.

Therefore, the design of poultry housing systems is crucial for establishing the internal environmental conditions needed for optimal bird health and productivity. Here, enters the next-generation Poultry House of the Future. The design concept is focused on removing waste through an innovative flooring system (BHIG-MESS) and optimizing the volume of conditioned air in the house through an inflatable roofing system (known as the "Chicken Bubble").

BHIG-MESS or Broiler House Integrated Guided-Motion Excreta Saturation System addresses moisture and odor concerns by removing poultry waste from the house regularly and automatically.

"Our BHIG-MESS system addresses the moisture generated by evaporation from chicken waste, which accounts for about 70 to 80 percent of moisture in a typical poultry house," says Samoylov.

BHIG-MESS uses a raised tile flooring system that allows chicken waste to fall into a removal tray beneath. In traditional poultry houses, wood shavings are placed on fixed flooring, and while the shavings absorb the waste, they remain in place throughout the flock's growout period. In contrast, BHIG-MESS's unique flooring system enables daily

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automatic removal of waste, which significantly reduces moisture levels inside the house along with the requisite ventilation.

Recent field trials evaluating BHIG-MESS were conducted at the University of Georgia's (UGA) Poultry Research Farm. Dr. Brian Fairchild in UGA's Department of Poultry Science is a project collaborator.

During the field trials, researchers replaced half of the experimental house's floor with the BHIG-MESS flooring system, while the other half contained traditional wood shavings. The flock was raised for seven weeks. Each week the team collected data on manure accumulation, bird health, and weight distribution.

The Poultry House of the Future's flooring system was evaluated during a seven-week field trial at UGA's Poultry Research Farm. The innovative flooring system can be seen at the beginning of the trial (left). At the end of the trial, results showed the chickens raised on the BHIG-MESS flooring had fewer instances of footpad dermatitis and similar weight gain patterns compared to those raised on traditional wood shavings.

Results showed the chickens raised on the BHIG-MESS flooring had fewer instances of footpad dermatitis, a condition often caused by wet and dirty litter that inflames and irritates the skin on the bottom of their feet. They also showed similar weight gain patterns to those raised on traditional wood shavings.

"Our BHIG-MESS system promotes hygiene and cleanliness. It also enhances productivity by maintaining a healthier and more comfortable environment for the birds," says Samoylov.

Ongoing research is also focused on reducing house ventilation requirements. Although only a small portion of the poultry house's vertical space is utilized by the birds (typically 2 to 3 feet in height), managing temperature and humidity requires adjustments for the entire volume of air in the house.

"Maintaining an optimal climate for poultry health and productivity involves heating or cooling the entire air mass within these expansive structures," says Samoylov. "This approach, while necessary, leads to significant energy expenditure and operational costs due to the large volume of air being treated."

The "Chicken Bubble" uses an inflatable barrier that reduces the amount of air that needs conditioning, still keeping the birds comfortable while also reducing energy consumption.

According to Samoylov, because the chicken bubble displaces a significant portion of air inside the house, it could help poultry farmers cut ventilation requirements by at least half.

The team plans on conducting further field trials, and Samoylov anticipates testing results will show measurable reductions in energy use and operating costs, while enhancing bird comfort and growth outcomes.

In the meantime, efforts are focused on refining both systems, with the long-term goal of commercialization.

The team plans on conducting further field trials, and Samoylov anticipates testing results will show measurable reductions in energy use and operating costs, while enhancing bird comfort and growth outcomes.

"We will engage with manufacturers for a design for manufacturability (DFM) study to select scalable materials and hardware, ensuring the solution is practical and commercially viable," says Samoylov.

The team filed two U.S. patent applications last year. The BHIG-MESS system is described in "Tile Cleaning System and Associated Methods," while Chicken Bubble is described in "System for Partially Filling an Enclosure."

Positioning Georgia as the Leading State in Agricultural Technologies (AgTech) Development and Deployment

Georgia has long been a major producer and exporter of agricultural commodities in the U.S. with poultry, cotton, eggs, peanuts, and timber taking the top spots in order of value [1]. The importance of supporting this important segment of the state's economy has never been greater with rising costs of inputs and fluctuating global markets. One key potential advantage that can be leveraged is Agricultural Technologies or AgTech. This is also sometimes known as precision or digital agriculture, but it is essentially the deployment of modern technologies, such as GPS guidance or sensing and intelligent controls, to improve the efficiency and quality of products being produced.

Several years ago, the Georgia Tech Research Institute (GTRI) through our state-funded Agricultural Technologies Research Program (ATRP) partnered with the University of Georgia's College of Agricultural and Environmental Sciences and the Georgia Department of Agriculture to cast a vision and provide a roadmap for positioning Georgia as a leader in AgTech. Since then, development has continued both in industry and on the university research front to develop and deploy technologies into different segments of Georgia's agricultural sector.

For more than 50 years, ATRP has sought to deploy technologies in the areas of automation and robotics, advanced sensing, chemical and biological systems, energy and environmental technologies, and novel engineered systems into poultry processing and production. Specific examples include developing sensors for the detection, management, and decay measurement of peracetic acid (PAA) in poultry chillers, ground robotics for breeder and broiler house management, enhanced chilling systems for improved thermal control, intelligent deboning robotics, egg fertility and microbial contamination determination, and novel concepts for the future of poultry housing and transportation (see article on page 1).

The University of Georgia has recently launched the Institute for Integrative Precision Agriculture (IIPA), which brings together academic faculty from a variety of disciplines to tackle challenges facing many of the state's commodity sectors. This includes the opening of a Grand Farm in Perry, Georgia, that is to serve as a test and development bed for companies and researchers seeking to deploy new agricultural technologies.

ATRP has been invited to support this initiative by participating in IIPA conferences, workshops, and a variety of collaborative opportunities. ATRP's contribution has been primarily in the poultry domain, and while we think this will remain our core strength, we are excited to be plugged into the broader agriculture community. Ultimately, these efforts have the potential to meet the objectives outlined in the initial roadmap, from several years ago, of positioning Georgia as an innovation leader in AgTech.

While there is still a long way to go in addressing all of the AgTech opportunities across the state, this partnership is exciting and will be key to strengthening Georgia agriculture more broadly. We certainly feel that it fits within our vision of "transforming poultry, agribusiness, and food manufacturing through advanced technologies."

Doug Britton, Ph.D.
ATRP Program Manager

[1] 2024 Ag Snapshots, University of Georgia Center for Agrbusiness and Economic Development, 2024, https://fieldreport.caes.uga.edu/publications/AP129-2/2024-ag-snapshots/

Shedding Light on the Potential Impact of "Forever Chemicals" on the Poultry Industry

Christopher Heist, Ph.D., senior research scientist and the R. Harold and Pasty Harrison Research Faculty Fellow in Poultry Technologies, shares insights on per- and polyfluoroalkyl substances (PFAS), commonly known as "forever chemicals," and their potential impacts on poultry processing.

Per- and polyfluoroalkyl substances (PFAS) are a large class of synthetic chemicals characterized by strong carbon-fluorine bonds, which give them exceptional resistance to heat, water, and oil, as well as chemical stability. Since the 1940s these compounds have seen widespread use in industrial applications as well as consumer products including nonstick cookware, water-proof fabrics, firefighting foams, and food packaging. However, those benefits come at a cost as these compounds are highly resistant to degradation, earning them the nickname "forever chemicals," as they persist in soil, water, and air, and can bioaccumulate within wildlife and humans overtime.

Exposure to certain PFAS has been linked to a range of health concerns, including immune system effects, developmental impacts, and increased risk of some cancers. In the United States, regulation of PFAS has evolved rapidly in recent years as scientific understanding and public concern have grown. Historically, PFAS oversight relied mainly on voluntary industry phaseouts and state-level initiatives, but federal action has accelerated under the U.S. Environmental Protection Agency's (EPA) PFAS Strategic Roadmap.

Key milestones include the 2024 establishment of the first enforceable national drinking water standards for six PFAS, although now only perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) are included, under the Safe Drinking Water Act, setting Maximum Contaminant Levels (MCLs) as low as 4 parts per trillion (ppt).

Today, PFAS contamination is recognized as a significant global environmental and public health challenge, prompting growing regulatory actions, research efforts, and mitigation strategies. Researchers within the Georgia Tech Research Institute's (GTRI) Agricultural Technology Research Program (ATRP) have engaged in PFAS-related research for the past several years covering topics including laboratory-based detection and destruction methods, industry collaboration on the development of low-cost, portable detection systems, and wastewater analysis techniques.

Although ATRP's PFAS research related to the poultry industry is in its infancy, the team is in frequent communication with partners in the poultry industry ensuring that research topics align with industry interests. Areas of particular interest are potential PFAS entry points into the production cycle including contaminated water sources, feed ingredients and additives, processing and packaging, as well as environmental deposition through wastewater processing and disposal and potential bioaccumulation within the food chain.

These research areas will help answer the ultimate question of whether or not the poultry industry has a potential PFAS problem on its hands. Although no one knows how drastic the effects of current and future PFAS regulations will be on the poultry industry, the team is prepared to help mitigate these effects through close collaboration with industry partners.

In the spirit of collaboration and industry engagement, initial research insights were presented at the U.S. Poultry & Egg Association's 2025 National Safety Conference for the Poultry Industry in Destin, Florida. Speaking to more than 300 attendees, the presentation titled "Forever Chemicals: Detection and Mitigation Best Practices," introduced what PFAS chemicals are and why their persistence and mobility make them a growing concern for many industries, including poultry, and the upcoming regulations. The presentation also provided an overview of the latest detection methods, including EPA Method 1633, as well as best practices for sample collection to ensure accurate and reliable results as well as the importance of routine testing. Finally, available mitigation strategies that have already proven effective at PFAS removal from water such as granular activated carbon (GAC), ion exchange, and reverse osmosis were also discussed.

Editor's Note: Heist discussed ongoing research on PFAS in a recent episode of the GTRI Podcast (scan the QR code to listen or visit gtri.gatech.edu/podcast, Spotify, or Apple Podcast) and was a featured speaker at the second annual Georgia Food Safety Regulatory Symposium held on November 5 in Atlanta.

RESEARCHER PROFILE

Trent Black

Job title: Research Engineer I

Education: B.S., Computer Engineering, Brigham Young University–Idaho

Areas of research expertise: Software and hardware design

List of any poultry industry projects you're working on and your role:

- Poultry House of the Future — I have been working on the camera capture software to measure and analyze collected manure in trays per day.
- High Fidelity Data Collection and Analytics for Enhanced Broiler Breeder Livability — I wrote the camera capture software for taking images of chicken. *(This project was funded through the Cobb Research Initiative, a research grant program of Cobb-Vantress, LLC.)*

What I find most rewarding about working on poultry industry projects: It is rewarding to bring technology to a space that does not have the expertise to develop it without outside help. We get to make an impact.

A talent I wish I had: The ability to read more books.

Another occupation I'd like to try: I would like to try working on the hardware or software of drones.

My first job: Controls Engineer at G6 Engineering

If I could meet someone famous, who would it be and why: Nick Woodman — he created the GoPro. He was able to create GoPro pretty much out of his van.

One thing people may not know about me: I would love to live on a beach.

My day would not be complete without: Spending the evening watching a TV show with my wife.

The last book I read: Design Patterns Elements of Reusable Object-Oriented Software

The last movie I saw: F1

My favorite song: "I Ain't Coming Back" by Post Malone and Morgan Wallen

My motto: Speak softly and carry a big stick

My hobbies: Fix broken electronics and try new foods

Visit ATRP in Booth C27151 — Exhibit Hall C at the 2026 International Production & Processing Expo

The Agricultural Technology Research Program (ATRP) is excited about its plans to participate in the 2026 International Production & Processing Expo (IPPE), scheduled for January 27-29, at the Georgia World Congress Center in Atlanta, Georgia.

ATRP's exhibit will highlight the program's research advancements and display prototype systems that seek engineering solutions that enhance process efficiency and product safety in today's poultry plant. Program researchers will be available to answer questions, and a program video and handouts will describe current projects.

For more information, visit ippexpo.org

Kortney Martin Selected as R. Harold and Patsy Harrison Student Intern in the Abit Massey Student Internship Program

The Georgia Tech Research Institute's (GTRI) Agricultural Technology Research Program (ATRP) has selected Kortney Martin as the latest R. Harold and Patsy Harrison Student Intern. The internship began with the Fall 2025 semester and will continue through the Spring 2026 semester.

Funded by an endowment from the R. Harold and Patsy Harrison Foundation, the internship is awarded to an undergraduate student participating in ATRP's Abit Massey Student Internship Program. During the academic year, interns work alongside ATRP researchers on real-world challenges facing poultry production and processing, and have the opportunity to gain practical industry knowledge by networking with staff at local poultry companies. The goal is to prepare the next generation of researchers and professionals to produce significant advances in poultry innovation and technology.

"We are excited to have Kortney Martin as our latest R. Harold and Patsy Harrison Intern as part of the Abit Massey Student Internship Program here at Georgia Tech. This is a great opportunity for her to engage in real-world research in support of the state's poultry industry, and we are thrilled to have her as part of our ATRP team," said Doug Britton, ATRP program manager.

A Georgia native, Martin is a senior majoring in biology. She discovered ATRP while searching LinkedIn for research-based opportunities, and later accepted a position as an undergraduate student research assistant under the direction of Daniel Sabo, senior research scientist. The internship will broaden practical experience opportunities as she continues working alongside Sabo. Her primary focus will be on exploring solutions to extend the lifetime of peracetic acid (PAA), an antimicrobial agent used in poultry processing to ensure food safety and control microbial contamination in carcass chilling operations.

With research interests in genetics and microbiology, Martin said working with ATRP she has learned the interdisciplinary world that is poultry. "I never thought about how many different people and areas of expertise come to work together from the hatching and raising of birds, to processing, and everything in between," said Martin. "The projects that are worked on here are directly applicable to industry, and the multitude of projects that are occurring at any given time ensures that there's always something to do. I can't get bored; each week is something new in the best way."

She particularly enjoys being able to work in a chem-lab, which has allowed her to gain hands-on experience in quickly adjusting experimental procedures to account for unanticipated problems, developing and implementing new procedures, using new lab equipment, and learning how to do new biological growth assays. She has also sharpened her skill at communicating scientific information. A testament to that was the honor of receiving a Student Certificate of Excellence for Oral Presentation at the 2025 Poultry Science Association Annual Meeting, held July 14-17 in Raleigh, North Carolina. She won the award for her presentation titled "Identifying Chemical Methods to Optimize the Lifetime of Peracetic Acid."

On a personal note, Martin shared that she underwent brain surgery as a teenager. The surgery drastically changed the way her brain worked, from learning to communicating. "It's been a long process 'learning my brain,' and the opportunities I've encountered by working here have allowed me to keep challenging myself in new ways," said Martin. "Being here has solidified my passion for research, and I want to continue exploring new topics."

Established in 1973, ATRP develops advanced technology in support of Georgia's multibillion-dollar poultry industry, the state's leading agricultural sector. The technologies help poultry processors optimize operations and improve efficiency, safety, product yields, and environmental sustainability.

The R. Harold and Patsy Harrison Foundation was founded by the Harrisons' daughter, Bobbie Ann Harrison Reynolds, and her husband, Raymond H. Reynolds, Jr. (a Georgia Tech industrial engineering alumnus), in honor of her late parents with a primary goal to strengthen and support education. Her father founded Harrison Poultry in 1958 in Bethlehem, Georgia.

The Abit Massey Student Internship Program is in honor of the late Abit Massey, president emeritus of the Georgia Poultry Federation, who was instrumental in ATRP's founding.

Meat Institute Study Finds U.S. Meat and Poultry Industry Provides Billions in Economic Impact

New Study Details Comprehensive Data on Jobs, Taxes, and Value Provided Nationally in 2025

A new study recently released by the Meat Institute found that the U.S. meat and poultry processing industry contributes $57.3 billion to the nation's economy, while providing nearly 584,000 jobs. In addition, when accounting for the supporting supply chain, the total economic impact rises to $347.7 billion and more than 3.2 million jobs.

"The meat and poultry industry is a critical and growing part of the U.S. economy, and one that has outsized importance to rural economies," said Meat Institute President and CEO Julie Anna Potts. "Our member companies are often the biggest employers in their rural communities, and their impact goes beyond jobs. In addition to the taxes they pay, they invest in their communities with generous donations of food and make financial and other irreplaceable contributions to local infrastructure like housing, community spaces, schools, and childcare."

The study further reported the industry's economic impact as follows:

Direct Contributions: $40.6 billion in labor income; $311 billion in total sales (output); $12.5 billion in local, state, and federal taxes

Indirect Contributions: $205.3 billion in labor income; $911.7 billion in total sales (output); $77.0 billion in local, state, and federal taxes

The study also provided economic impact estimates for each state and federal congressional district. According to the study, while the meat and poultry processing industry drives some economic activity in every state and nearly every district, some regions of the U.S. consistently rank at or near the top of the reported economic measures. Those include:

Top States: Texas, Nebraska, Iowa, Georgia, North Carolina, Kansas, California, and Arkansas

Top Districts: Nebraska–3, Iowa–4, Texas–13, Kansas–1, Minnesota–1, and Arkansas–3

In terms of total numbers, the study reported that the U.S. slaughters about 9 billion broilers, 200 million turkeys, 129 million hogs, and 30 million cattle. The top states by slaughter amount include:

Broilers: Georgia (1.3 billion), **Turkeys**: Minnesota (36.8 million), **Hogs**: Iowa (40.5 million), **Commercial cattle**: Nebraska (6.8 million)

In terms of employment impacts, the study reported the estimated jobs in each state derived from the meat and poultry processing industry. The top five states include:

Texas (446,037), Iowa (195,843), Nebraska (187,078), Georgia (160,210), and North Carolina (157,346)

To read the entire study, visit MeatInstitute.org and click "Meat and Poultry Economic Contributions" under the Resources tab.

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.

ATRP uses input from all assists to gauge situations calling for new research initiatives in energy, environmental, safety, and other areas.

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.

et cetera

Did You Know? The USDA regulates and oversees the language on meat and poultry labels. Here are some terms commonly found on chicken packaging.

All-Vegetable or Vegetarian Diet
Most poultry feed is made from corn and soybean meal, but sometimes also contains meat and poultry by-products, which are excellent sources of healthy vitamins, minerals, and proteins. If the feed does not contain any of these products, it can be labeled "All-Vegetable Diet" or "Veggie Fed."

Antibiotics Claims
All chicken you buy is technically "antibiotic free" — federal rules state that if any antibiotics are required, they must have cleared the birds' systems before they can leave the farm. Some chickens are raised without the use of antibiotics. In the store, these chicken packages may be labeled a number of different ways, including "No Antibiotics Ever," "Raised Without Antibiotics," or similar terms.

Cage Free
Broilers are raised in large, open barns. So, all chicken you buy from a store is raised cage-free, whether it is labeled "cage free" or not.

Enhanced
A chicken product has been "enhanced" if it contains an added marinade or ingredients for flavor, which typically include water, salt, sugar, chicken broth, or seasonings like garlic. If a product is enhanced, it must clearly say so on the front of the package, along with a list of every ingredient and how much of it was used.

Farm-Raised
All chickens raised in the U.S. for meat are farm-raised, in spacious barns equipped with temperature controls, clean feeding and water systems, and protection from any predators or external elements that could affect the health of the chickens.

Free-Range
Generally, "free-range" is included on a label when the chicken has access to the outdoors. Not all free-range chicken is organic, but all organic chicken is free-range.

Fresh
"Fresh" means the temperature of whole poultry and cuts has never fallen below 26°F (the temperature at which poultry freezes, unlike water).

Hatched, Raised, and Processed in the USA
More than 99% of chicken sold in the U.S. comes from chickens hatched, raised, and processed in the U.S. The only exception is a very small amount imported from Chile and Canada — which have food safety and quality standards equal to our own.

Natural
Under USDA regulations, a "natural" product has no artificial ingredients, coloring ingredients, or chemical preservatives, and is minimally processed.

No Added Hormones or Steroids
Despite this label appearing on many chicken products found in the store, no chicken you buy is ever given added hormones or steroids. In fact, the use of such added or artificial hormones is forbidden by law by the FDA and this must be noted on the label.

Organic
Products carrying the "USDA Certified Organic" seal (regulated by USDA) mean the chicken has been fed only certified organic feed (corn and soybeans). The chicken is also free-range and has not been given antibiotics — though it may have been vaccinated against common diseases. Most of the processing practices are the same for chickens raised organically and conventionally. The Organic food label does not indicate that the product's safety, quality, or nutritional attributes are any higher than the conventionally raised product.

Pasture-Raised
Chickens that are primarily raised outdoors on pasture.

Retained Water
A "retained water" statement, such as "May contain up to 6% retained water" or "Less than 4% retained water," is often found on packages of fresh poultry. USDA does not allow retention of moisture in meat and poultry, except for any moisture resulting from essential safety procedures, such as chilling processed chickens in ice-cold water to keep them cool and slow the growth of any spoilage bacteria. If any moisture is retained by the chicken after these steps, it must be stated on the label.

USDA Processed Verified
Companies with approved USDA Process Verified Programs are able to make marketing claims associated with their process verified points such as age, source, feeding practices, or other raising and processing claims and market themselves as "USDA Process Verified." Process Verified means that a company has been evaluated and verified by the USDA in these areas.

Source: chickencheck.in (a website sponsored by the National Chicken Council)

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