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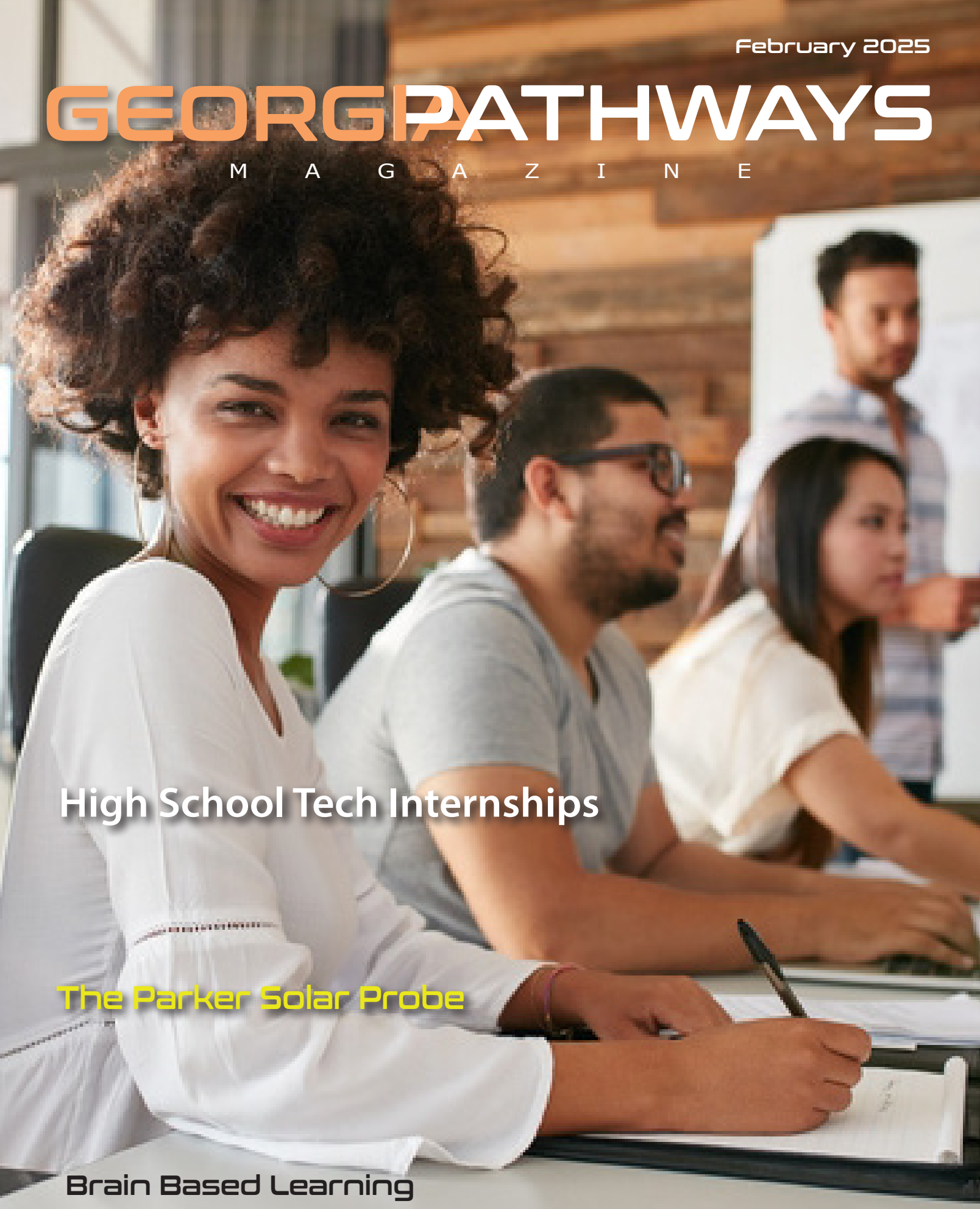
GEORGIA PATHWAYS

MAGAZINE



High School Tech Internships

The Parker Solar Probe

Brain Based Learning

The Technology Association of Georgia Education Collaborative (TAG-Ed) strengthens the future workforce by providing students with relevant, hands-on STEM learning opportunities and connecting them to Technology Association of Georgia (TAG) resources.

Formerly the TAG Foundation, TAG-Ed is a 501(C)(3) non-profit organization formed by TAG in 2002. Later, the organization's name was re-branded to TAG Education Collaborative to facilitate our role as the leaders for K-12 STEM education in Georgia.

President / CEO
Larry K. Williams

Executive Director
Dr. Loretta Daniels
http://www.tagedonline.org

Publisher
Wayne Carley
wayne@tagonline.org

Unlocking Future Success: The Impact of High School Tech Internships

Early exposure to technology careers is becoming increasingly necessary and valuable because it helps interested students develop essential skills, explore career options, and gain a competitive edge in the job market. With the growing popularity of computer science degrees, more candidates than ever are entering the job market with technical skills, making it more challenging to secure entry-level positions. DataUSA reports that the number of students in the U.S. majoring in computer and information science has increased by 40% over five years, reaching more than 600,000 as of 2023.

High school internships can be instrumental in gaining tech experience in preparation for the job market. These opportunities provide students with hands-on experience and skill development, helping them discover their interests within the technology field. Exposure to different areas, such as cybersecurity, artificial intelligence, data science, or robotics, allows students to make informed decisions about their academic and career paths. By working on real-world projects, students develop problem-solving skills, teamwork, and adaptability—highly sought after in the industry.

Beyond gaining professional experience, completing high school internships strengthens resumes and college applications and can open doors to future opportunities. Forty percent of high school internships lead to full-time employment (NSHSS), and 89% of employers believe students with internship experience have a competitive advantage when seeking college internships or full-time employment (SHRM).

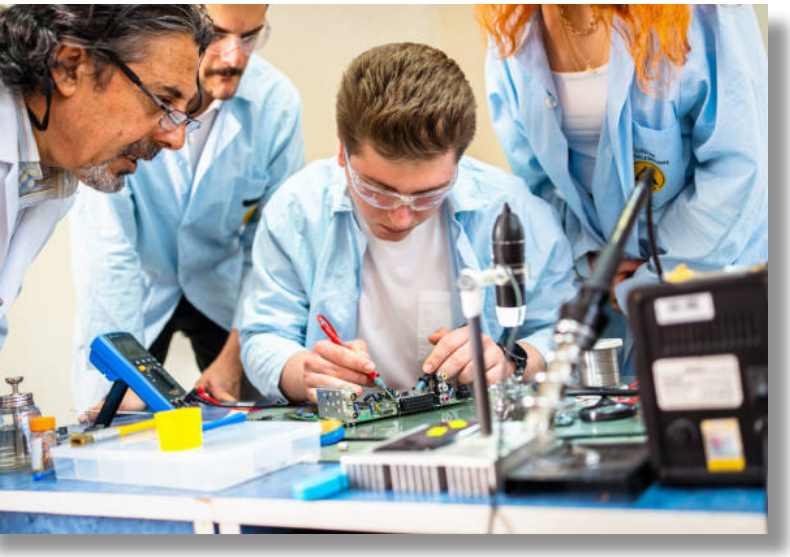
The Technology Association of Georgia's TAG Education Collaborative (TAG-Ed) offers a high school tech internship program. This program places exceptional high school seniors with participating technology companies based on their interests and qualifications. Selected students can gain real-world experience and hands-on learning in a STEM field for eight weeks during the summer. These internships build critical technical and professional skills and foster networking opportunities with industry professionals who can provide guidance and mentorship. For more information, please visit tagedonline.org.

Larry K. Williams
President
TAG / TAG-Ed

Larry K. Williams serves as the President and CEO of the TAG and the TAG Education Collaborative. TAG-Ed's mission is to strengthen Georgia's future workforce by providing students with relevant, hands-on STEM learning opportunities by connecting Technology Association of Georgia (TAG) resources with leading STEM education initiatives.

The Value of Tech High School Internships

By Wayne Carley



Internships have become a crucial part of students' career journey. Today's competitive job market and college application process present unique challenges to students, especially those without prior experience or connections. This is where internships become important - bridging the gap between academic knowledge and practical experience. Internships provide students with invaluable hands-on experience in professional settings and the necessary skills and insights they need to succeed in their chosen fields.

High school internships in tech can help you build skills, make connections, and gain real-world experience. These experiences can help you stand out to colleges and future employers.

The Power of Self-Discovery

For high school students, internships serve as a mean to explore their career options and college majors. While students are often influenced by parents or peers to pursue a certain major or career path, internships will empower students to discover their hidden talents and unlock greater potential. Students will get to explore new avenues for professional and personal development by taking part in tasks outside their comfort zones. High school students can gain a deeper understanding of their strengths, interests, and motivations by gaining hands-on experience and exposure to various industries.

The Power of Experience

As a bridge between academic knowledge and real-world application, internships provide students with first-hand experience in a professional environment. By participating in internships, high school students acquire practical skills, develop their interests outside of school, and showcase their unique accomplishments in ways that are different from their peers. An internship allows students to immerse

themselves in different workplace cultures, practice communication skills, and gain exposure to determine whether the career of interest is a good fit.
The value of internships extends beyond experience as interns can showcase their acquired skills on their resumes, get letters of recommendation, or receive job offers, giving students an early competitive edge in high school and laying a solid foundation for future success.

Skill development

- Apply classroom knowledge in real-world settings
- Learn new skills and refine existing ones
- Gain exposure to different working environments
- Get a taste of what it's like to have a full-time job
- Understand your interests and motivation
- Explore different career paths
- Refine your career goals

Whether it is speaking to clients, presenting to your boss, or producing research materials for the first time, being able to receive constructive feedback and face challenges head-on are some of the best ways to gain confidence. Internships allow high school students to apply their classroom learning and build confidence through real-life professional scenarios.

"89% of employers said that students with a high school internship will have a competitive advantage when looking for a college internship or full-time job, according to a report by Internships.com"

Through internships, high school students will be encouraged to develop their communication skills, ask relevant questions, and contribute their ideas efficiently. Internships enable high school students to become more confident and prepared for future endeavors.

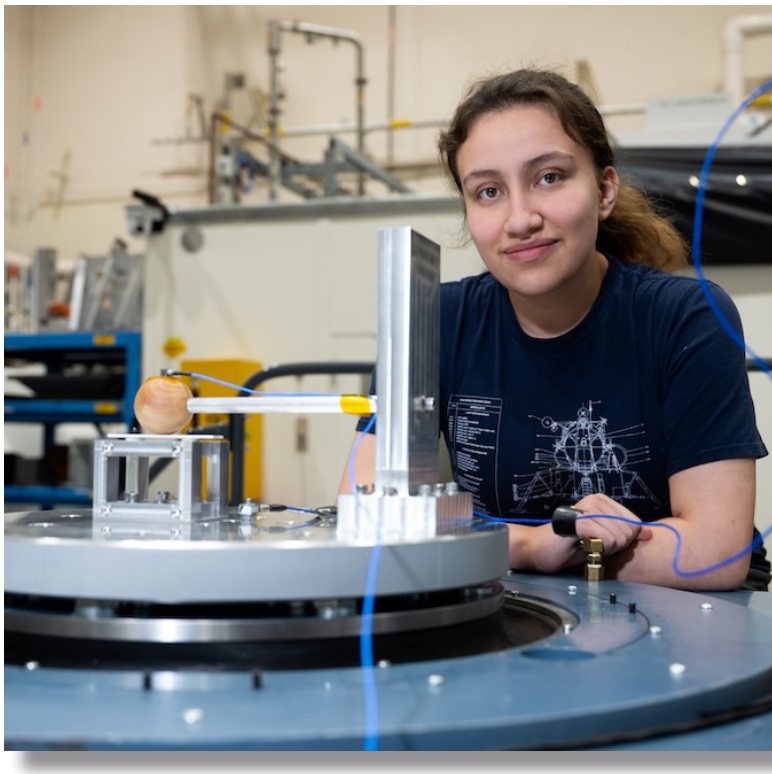
The Power of Networking

Taking part in internships gives high school students a unique opportunity to expand their network outside the classroom. Internships allow students to establish meaningful connections with working professionals from diverse backgrounds, creating a powerful network and receiving mentorship from industry leaders for an early head-start on professional and personal development. Networking starts even before you land the internships.

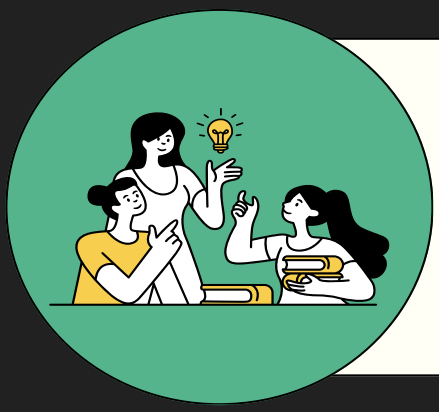
- Connect with industry professionals, mentors, and peers.
- Learn about industry trends and best practices.
- Develop professional connections that can lead to future job opportunities.

Keep an eye out for a career day or a job fair at your school or town. Make sure to introduce yourself to the company representatives, send a follow-up email, and actually build a professional relationship with that person.

Networking is not just about wearing a suit and shaking hands, but also about meeting people, connecting with them, asking good questions, and being genuinely curious about their careers. Take care to brush up on your "soft skills" and personal appearance. You only get one chance to make a first impression.



How Highschool Students Can Prepare for a Tech Career in the Medical Field



01. STEM COURSES AND SUBJECTS

Focus on excelling in life and physical science courses like biology, chemistry, and physics. Exploring health science can provide a solid foundation of medical concepts.

02. COMPUTER SCIENCE & CODING

Gaining a solid foundation in computer science and coding is also an essential part of the modern medical field, with languages like Python, Java, or C++ being particularly useful.

03. SOFT SKILLS

Developing soft skills like communication, teamwork, and problem-solving through group projects or leadership roles is also crucial.

TAG | TAG-Ed Education Collaborative

For more STEM Education resources, visit tagedonline.org

2025 GEORGIA STEM DAY

March 7th, 2025

9:00 AM - 2:00 PM

BRIDGING THE GAP BETWEEN CLASSROOM LEARNING AND EXCITING FUTURE CAREERS!

Georgia STEM Day is a full-day, free webinar that aims to help students bridge the gap between classroom studies and future career opportunities. It features various professionals showcasing real-world applications of STEM disciplines in their professional settings.

EVENT HIGHLIGHTS

- **AI & STEAM Panel:** Experts discuss how AI is shaping future innovators.
- **Ethical Hacking & Cybersecurity:** Learn how radio waves impact digital security.
- **GA Aquarium & NOAA Weather Science:** Dive into marine and weather exploration.
- **Coding for Educators:** Free resources to introduce students to programming.
- **Theater & STEM:** Engage in creative strategies for math and science learning.

PRESENTING ORGANIZATIONS

National Weather Service

She learns

LM PM Consulting

Georgia State University J. Mack Robinson College of Business

Alliance Theatre

Raspberry Pi Foundation

Georgia Aquarium

Georgia Tech Research Institute

View the full agenda and register here!

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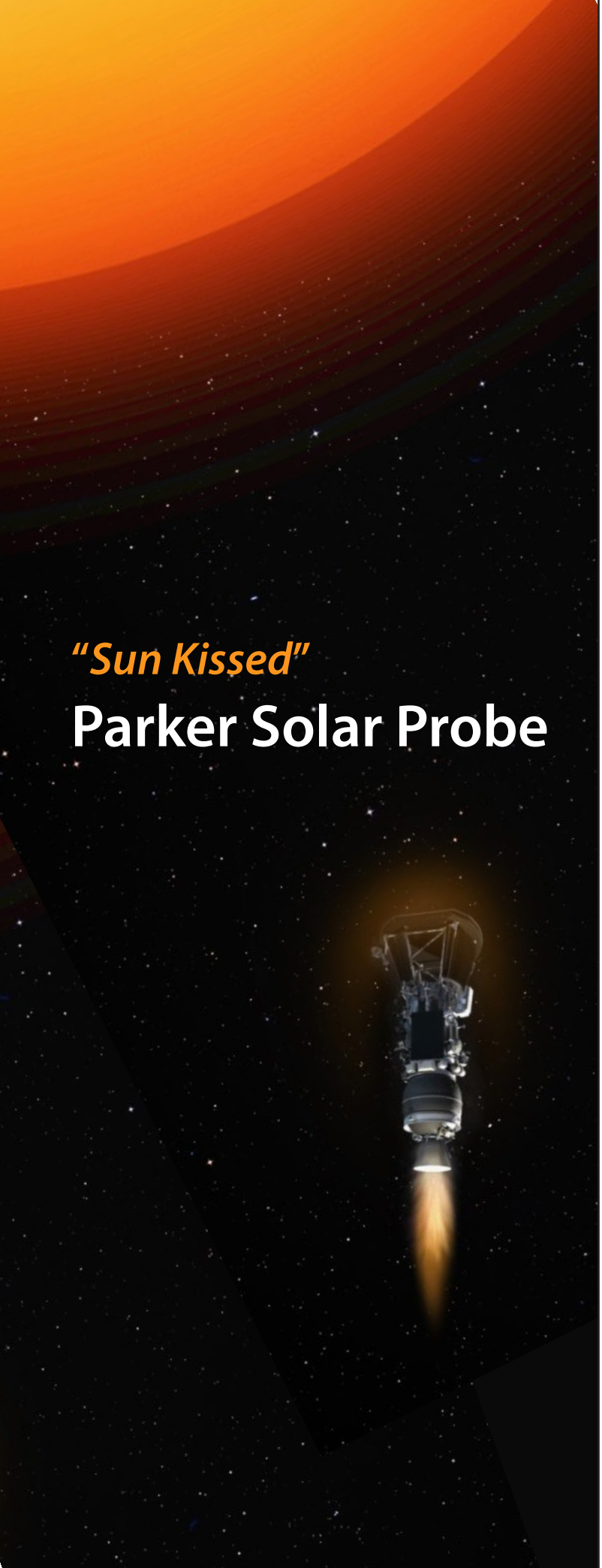


"Sun Kissed"

Parker Solar Probe

For the first time in history, a spacecraft has touched the Sun. NASA's Parker Solar Probe has now flown through the Sun's upper atmosphere – the corona – and sampled particles and magnetic fields there.

NASA has confirmed the mission to "touch" the Sun survived its record-breaking closest approach to the solar surface on Dec. 24, 2024. Breaking its previous record by flying just 3.8 million miles above the surface of the Sun, NASA's Parker Solar Probe hurtled through the solar atmosphere at a blazing 430,000 miles per hour — faster than any human-made object has ever moved. A beacon tone received late on Dec. 26 confirmed the spacecraft had made it through the encounter safely and is operating normally.

On its mission to "touch the Sun," NASA's Parker Solar Probe became the first spacecraft to fly through the corona – the Sun's upper atmosphere – in 2021. With every orbit bringing it closer, the probe faces brutal heat and radiation to provide humanity with unprecedented observations, visiting the only star we can study up close.

(Many of the terms used in this article are defined at the end of the article)

NASA's Parker Solar Probe is revolutionizing our understanding of the Sun. The spacecraft is gradually orbiting closer to the Sun's surface than any before it – well within the orbit of Mercury. Flying into the outermost part of the Sun's atmosphere, the corona, for the first time, Parker Solar Probe is collecting measurements and images to expand our knowledge of the origin and evolution of solar wind. It also makes critical contributions to forecasting changes in the space environment that affect life and technology on Earth.

- Parker will fly more than seven times closer to the Sun than any spacecraft.

- Over seven years, the spacecraft will complete 24 orbits around the Sun.

- At its closest approach, the spacecraft will come within about 3.9 million miles (6.2 million kilometers) of the Sun.

To perform its unprecedented investigations, the Parker Solar Probe and its instruments are protected from the Sun by a 4.5-inch-thick (11.43 cm) carbon-composite shield, which can withstand temperatures reaching nearly 2,500 degrees Fahrenheit (1,377 Celsius). NASA's Parker Solar Probe is diving into the Sun's atmosphere, facing brutal heat and radiation, on a mission to give humanity its first-ever sampling of a star's atmosphere.

Parker Solar Probe is designed to swoop within about 4 million miles (6.5 million kilometers) of the Sun's surface to trace the flow of energy, to study the heating of the solar corona, and to explore what accelerates the solar wind.

During its journey, the mission will provide answers to long-standing questions that have puzzled scientists for more than 60 years: Why is the corona much hotter than the Sun's surface (the photosphere)? How does the solar wind accelerate? What are the sources of high-energy solar particles?

We live in the Sun's atmosphere and this mission is helping scientists better understand the Sun's impact on Earth, our weather conditions, dangers to electronics and orbiting satellites. Data from Parker will be key to understanding and, perhaps, forecasting space weather that can change the orbits of satellites around Earth and other planets within our solar system, shortening their lifetimes, and interfering with onboard electronics.

Parker can survive the Sun's harsh conditions because cutting-edge thermal engineering advances protect the spacecraft during its dangerous journey.

The probe has four instrument suites designed to study magnetic fields, plasma, and energetic particles, and image the solar wind.

Through the solar wind, the Sun touches every part of our solar system and impacts everything including creating auroras and stripping planets' atmospheres such as Mars as we focus on that planet this century.

The solar wind starts its journey at the Sun and emanates from features on the Sun such as dark and cool regions called coronal holes and active regions, which are characterized by strong magnetic fields.

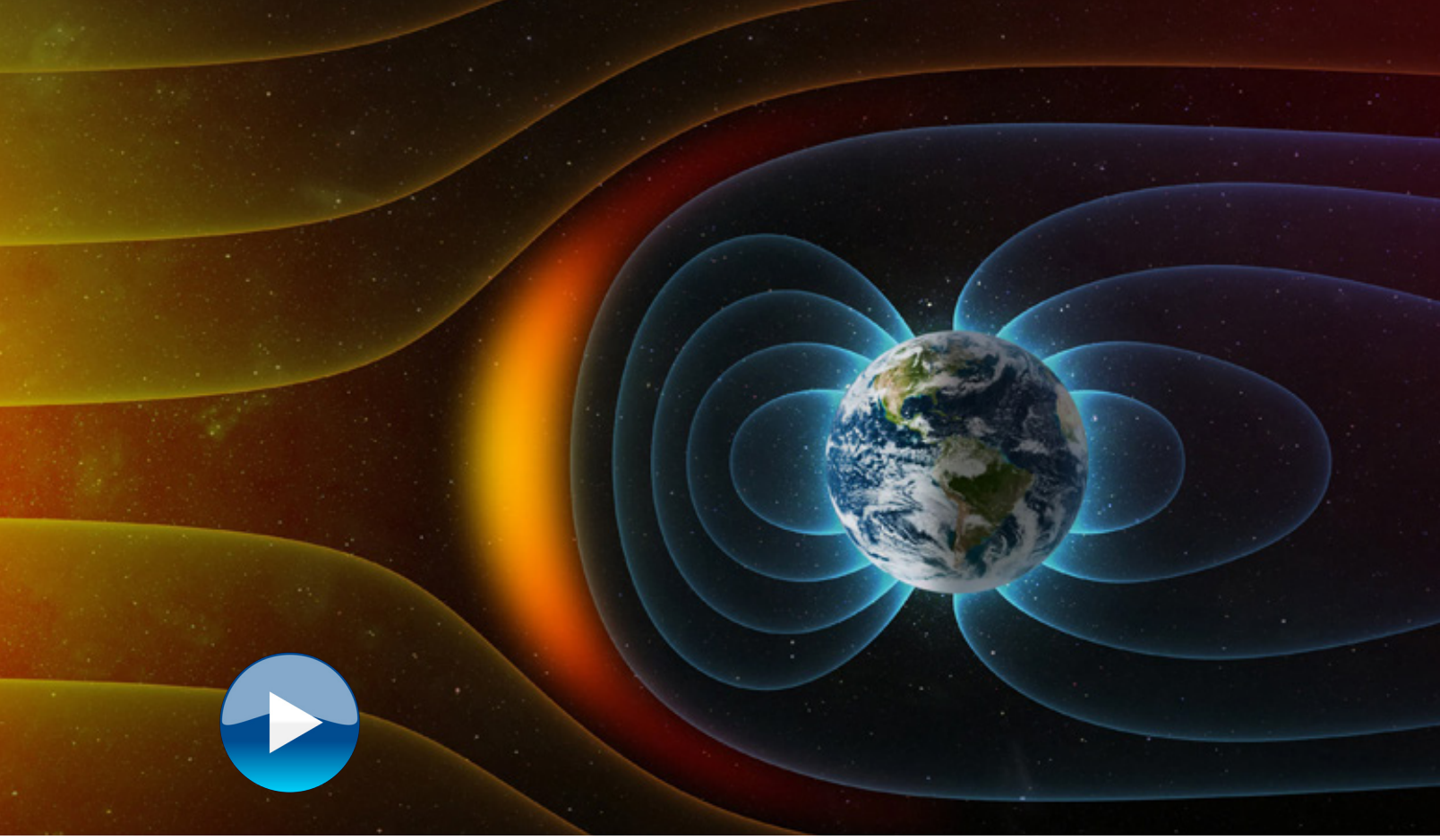
These regions release solar wind with different speeds and densities, but all release the same basic components of solar wind — electrically charged particles such as protons and electrons. As the solar wind gushes out, it drags the Sun's magnetic field with it. The stretched out solar magnetic field ends up in the shape of a spiral due to the Sun's rotation.

This spiral was named after preeminent solar scientist Eugene Parker, who developed the first theory of the solar wind in 1958. The first measurement confirming the existence of the solar wind came the following year, with the launch of the first spacecraft to leave Earth's orbit.

Since the solar wind's particles are charged, they follow these spiraled magnetic field lines as they burst out from the Sun. As they travel, the particles and magnetic field can create what are known as plasma waves.

These waves occur as fluctuating electric and magnetic fields plow through clumps of ions and electrons in all directions at speeds of about 1 million miles per hour (400 km/s).

As the solar wind projects further and further outward from the Sun, it spreads itself thin and can no longer resist the inward push of the instellar space medium (the part of our galaxy that lies between the stars). At this point, it passes through a shock wave, called the "termination shock," and becomes subsonic (slows down).



This subsonic flow region is called the heliosheath, which extends to the heliopause, the boundary where the heliosphere meets the interstellar medium. Earth's magnetic shield has similar topography: magnetic field lines, a magnetosheath, and magnetopause.

The Parker Solar Probe continues it orbital quest of the sun and promises to reveal more insights into how the sun impacts the Earth and other worlds in our solar system. Thanks to the visionary work of Dr. Eugene Parker in solar and plasma physics, we are just now understanding our relationship with our star in ways that may safeguard our world and the brave astronauts who will be spending greater amounts of time in space.

Dr. Eugene Parker

In the mid-1950s, Parker developed the theory of supersonic solar wind and predicted the Parker spiral shape of the solar magnetic field in the outer Solar System. His theoretical modeling was not immediately accepted by the astronomical community. Parker's theoretical predictions were confirmed by satellite observations a few years later, especially the 1962 Mariner 2 mission.

Parker's work increased understanding of the solar corona, the solar wind, the magnetic fields of both the Earth and the Sun, and their complex electromagnetic interactions. In 1972, he formulated what became known as the Parker theorem, which showed how the topology of magnetic field lines in the solar

corona of the Sun (and similar stars) can produce flares at X-ray energies.

He published several textbooks, including Cosmical Magnetic Fields in 1979, and one on magnetic fields in X-ray astronomy in 1994. Seeking to address the coronal heating problem, in 1987 Parker proposed that the solar corona might be heated by myriad tiny "nanoflares", miniature brightenings resembling solar flares that would occur all over the surface of the Sun.

"*The field of heliophysics exists in large part because of Dr. Eugene Parker,*" said Thomas Zurbuchen, NASA's associate administrator for science. "*Honoring his work by giving Parker Solar Probe his name is one of the proudest accomplishments of my career. My work, my passion for science, and my drive to keep exploring is strongly influenced by this great man.*"

Although Dr. Parker passed away in 2022, before he could see the astonishing accomplishments of the probe named for him, his vision, imagination, and steadfast pursuit of his passionate theories, as well as witnessing the launch in 2018 of the probe named for him, no doubt brought him great satisfaction and joy.

Terms from the Parker Solar Probe article

Heliophysics

Heliophysics is the study of the Sun, its planets, and the space environment as a dynamic system. It includes the study of the Sun's magnetic activity, the solar wind, and how they affect Earth, other planets, and the heliosphere.

Heliophysics is a combination of the words "helio" and "physics". "Helio" comes from the Attic Greek word helios, which means "Sun". "Physics" is the science of matter, energy, and their interactions. Heliophysics is important because it helps us understand how the universe works, and how to protect astronauts and technology in space. For example, space weather can disrupt communications, satellites, and power grids.

Corona

The Sun's corona is the outermost layer of the Sun's atmosphere, made up of plasma, or hot ionized gas: The corona is hundreds of times hotter than the Sun's surface, with temperatures ranging from 1.7 million to more than 10 million degrees Fahrenheit.

Nanoflares

A very small solar flare which occurs regularly in the corona- the external atmosphere of the sun.

Magnetosheath

The magnetosheath is the area of space between a planet's bow shock and magnetopause. It's a region of magnetic turbulence where the planet's magnetic field is irregular and weak.

The magnetosheath is made up of shocked solar wind plasma. It acts as a cushion, transmitting pressure from the solar wind and the planet's magnetic field. The magnetosheath is a transitory state with a particle density that's higher than the magnetopause but lower than beyond the bow shock.

Heliosphere

The region in space influenced by the sun or solar wind.

Magnetopause

The Sun's magnetopause, also known as the heliopause, is the boundary between the Sun's magnetic field and the interstellar space material. It marks the end of the Sun's stellar environment and the beginning of the interstellar environment.

Interstellar medium

The material between stars. About 99% of the material between the stars is in the form of a gas—that is, it consists of individual atoms or molecules. The most abundant elements in this gas are hydrogen and helium (which we saw are also the most abundant elements in the stars), but the gas also includes other elements. Some of the gas is in the form of molecules—combinations of atoms.

Bow Shock

A bow shock is a shock wave that occurs when a supersonic wind interacts with a planet's magnetic field or a star's stellar wind. In space, a bow shock occurs when the solar wind collides with a planet's magnetic field. The solar wind is slowed and heated by the planet's magnetosphere, and then takes a detour around the planet. This is similar to a sonic boom on Earth.

Termination Shock

The termination shock is the boundary where the solar wind slows down and becomes denser / thicker, marking the transition from the supersonic solar wind to the slower flow in the heliosheath. The solar wind is a thin stream of electrically charged gas that travels away from the Sun in every direction at speeds of 300–700 kilometers per second. (convert to miles per hour)

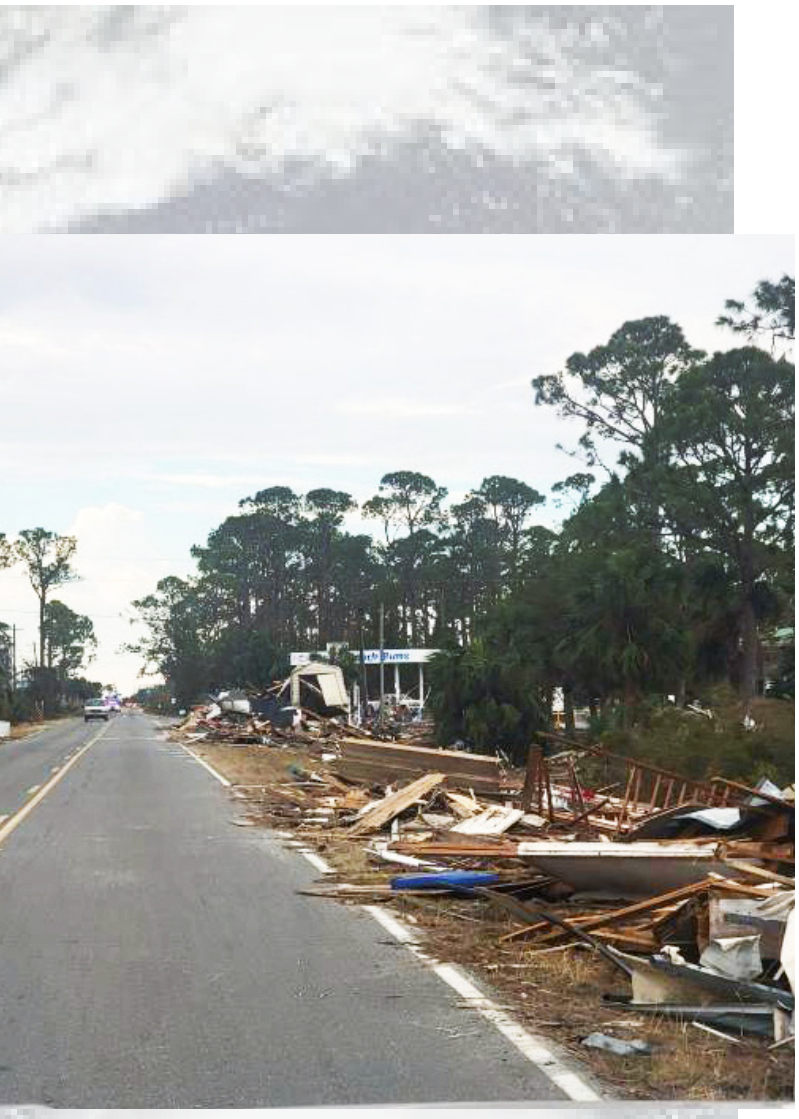
When it reaches the termination shock, solar wind slows down due to the pressure of the interstellar medium (. The termination shock is one of the most important boundaries in the outer heliosphere.

"There is so much more to learn and explore if you have an interest. Dozens of career paths related to this article and space studies await you"

OAK RIDGE National Laboratory

A new kind of first responder: The role of technology in hurricane aftermath

By Casey T. Cochran / ORNL



A road cluttered with storm debris in a hurricane affected region. Credit: ORNL, U.S. Dept. of Energy

When Hurricane Helene hit the southeastern United States in September 2024, it brought widespread devastation and left communities grappling with power outages, damaged infrastructure and the overwhelming task of recovery. Just weeks later, Hurricane Milton followed, compounding the damage in already affected areas and pushing response teams to the limit.

Amid these back-to-back disasters, a specialized team from the Department of Energy's Oak Ridge National Laboratory was deployed to the field, using cutting-edge technology to gather critical data for both immediate recovery and future preparedness.

Led by ORNL's Andrew Duncan, the group dispatched two teams to the field, spending six days across Florida, North Carolina and East Tennessee. The team, including Zach Ryan, Brandon Stockwell, Jairus Hines, Matt Larson and Jason Richards, conducted over

Severe flooding and damage in North Carolina, as captured by ORNL's field team. Credit: ORNL, U.S. Dept. of Energy

100 drone flights, collecting more than 400 gigabytes of geospatial data. These flights, conducted in the wake of both Hurricanes Helene and Milton, focused primarily on energy infrastructure such as power poles and transmission lines. The data gathered will fuel ORNL's research into developing more effective disaster response tools, using machine learning models to detect damaged infrastructure.

"We set out to collect training data, but the impact went beyond that," said Duncan. "While we were out there, local authorities began reaching out to us once they realized what we could do. They saw the value in the data we were collecting and began asking us for assistance with their own recovery efforts."

The team used their drones to gather aerial imagery, which was processed and shared almost immediately with responders through ORNL's Mapster technology, a software platform that provides real-time geospatial data to aid in disaster response.

"With Mapster, within 10 minutes of landing the drone, we were able to push the data to ORNL, the Federal Emergency Management Agency and

other emergency response partners," Duncan added.

The team's quick deployment and immediate impact showcased ORNL's ability to collect and share valuable data in real time, even under the challenging conditions of post-disaster environments. A major limiting factor in disaster response is simply the amount of time it takes to translate collected data into useful information. The complete data workflow demonstrated during both Helene and Milton showcases ORNL's broader research efforts aimed at reducing the data-to-decision timeline and developing tools that will allow responders to act faster and more efficiently in future disasters.

As the team flew over the impacted areas, the scale of the devastation was clear. Duncan recalled a particularly emotional moment in Ezell Beach, where there was little left but piles of debris.

"In some areas, there was nothing to recover," he said. "It was devastating to see how completely the storm had wiped out entire neighborhoods. In these small communities, people's homes and lives were scattered across the streets. It really hit home why we're doing this."

The ability to provide immediate assistance proved invaluable to local utility workers. In one instance, Duncan described how the team helped a worker responsible for identifying downed power poles, a task that normally would take days. "We had a map ready for him in an hour," Duncan said. "It was amazing to see how much faster we could help these workers pinpoint the damage and get to work restoring power."

ORNL's efforts didn't stop with data collection on the ground. In the background, DOE's Environment for Analysis of Geo-Located Energy

ORNL researcher Zach Ryan controls a drone to collect geospatial data over hurricane-hit areas. Credit: ORNL, U.S. Dept. of Energy

The flooded and debris-filled aftermath of hurricane Helene in Ezell Beach, Florida. Credit: ORNL, U.S. Dept. of Energy

Information, or EAGLE-ITM, platform played an essential role in monitoring utility outages throughout both hurricanes. EAGLE-I was used extensively by state, local and federal agencies throughout their responses to Helene and Milton. ORNL has managed and maintained the platform since 2016.

"EAGLE-I helps us track where the biggest utility outages are, especially in rural areas where smaller counties might not get as much attention," said Aaron Myers, who leads the platform's development at ORNL.

During the response to Hurricane Helene, EAGLE-I saw a notable increase in users — including FEMA responders, decision-makers in DOE's Energy Response Center, and local emergency management officials — reflecting the platform's growing relevance in disaster management. "We've built a lot of trust within the response community," Myers said. "This time, the focus wasn't on teaching responders how to use the tool. They were asking us how to interpret the data and deconflict information from field reporting to ensure a consistent assessment of impacts on the ground."

Ultimately, EAGLE-I's accurate, real-time data gave decision-makers a clearer picture of where power outages were most severe, allowing them to prioritize recovery efforts in both large cities and more rural, underserved areas.

Looking ahead, ORNL's work during storms is setting the stage for significant advancements in disaster response. The aerial data collected by the unmanned aerial system teams will be used to train machine learning models that can automatically detect damage to critical infrastructure, reducing the need for manual assessments and potentially saving valuable time during future recovery efforts. Meanwhile, ongoing improvements to EAGLE-I aim to integrate even more advanced data analytics and remote sensing capabilities, ensuring that responders can make informed decisions quicker than ever before.

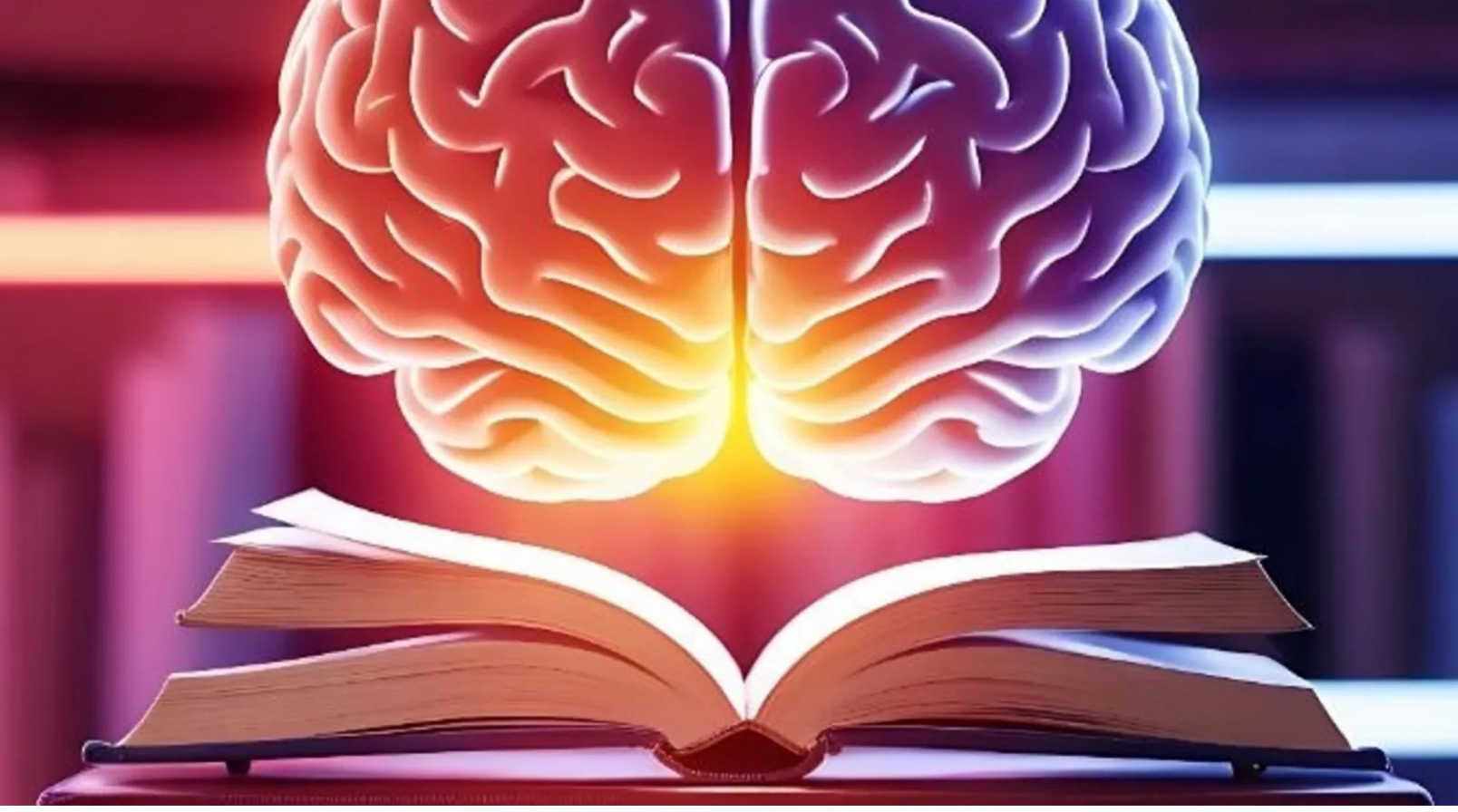
For the teams on the ground, the work was both challenging and deeply rewarding. Known as the "Duck Squad" — a nickname born from their Drone Unit Camera Kit (DUCK) — Duncan's group took pride in their ability to help communities when they needed it most.

"It's one thing to develop these technologies in the lab but being able to apply them in a real disaster environment and see how much they can help — it was incredibly fulfilling," Duncan said.

ORNL's role in supporting the responses to Hurricanes Helene and Milton highlights the power of science and in innovation in disaster response. As both the UAS teams and EAGLE-I continue to evolve, they are poised to become even more integral in helping communities recover from future storms, ensuring that the science and technology deployed today will pave the way for faster, more efficient recovery in the years to come.

EAGLE-I and ORNL's support to disaster response and recovery efforts are funded by the DOE Office of Cybersecurity, Energy Security, and Emergency Response, or CESER.

UT-Battelle manages ORNL for DOE's Office of Science, the single largest supporter of basic research in the physical sciences in the United States. DOE's Office of Science is working to address some of the most pressing challenges of our time. For more information, visit energy.gov/science.



The Need for Brain-Based Learning:
Addressing Modern Educational Concerns

By Dr. Cas Olivier

In a rapidly evolving world, the way we educate future generations must adapt to ensure they are equipped to tackle complex challenges. While advances in technology and pedagogy have reshaped some aspects of education, many systems remain rooted in practices developed during earlier industrial revolutions. These practices, characterized by rote memorization and standardized testing, are increasingly at odds with the skills and mindsets required for the 21st century. It is time to reimagine education through the lens of brain-based learning.

A Problem: Outdated Educational Paradigms

Most education systems still operate within a framework that prioritizes content delivery and summative assessment. These approaches, inherited from the First, Second, and Third Industrial Revolutions, emphasize uniformity, compliance, and recall over creativity, critical thinking, and problem-solving. This misalignment between educational methods and modern societal needs leads to disengaged students, unprepared graduates, and frustrated educators.

For STEM (Science, Technology, Engineering, and Mathematics) education, this gap is particularly concerning. STEM fields demand innovative thinkers who can navigate interdisciplinary challenges, yet traditional methods often stifle the very creativity and curiosity that these fields require.

A Solution: Brain-Based Learning

Brain-based learning shifts the focus from content acquisition to the processes of thinking and learning. It leverages the brain's natural wiring for problem-solving, creativity, and self-regulation, emphasizing formative assessments and experiential learning. At its core, this approach fosters intrinsic motivation and a growth mindset, empowering students to take ownership of their education.

Key Principles of Brain-Based Learning

- Understanding the Brain's Executive Function: The brain's executive function, often described as the "Mothership of All Thinking," coordinates critical cognitive processes such as problem-solving, decision-making, and self-regulation. Educators can harness this by teaching students how to use innate thinking tools, such as comparing and contrasting, analogical reasoning, and systems thinking.

- Flipped Teaching: Unlike the traditional flipped classroom model, flipped teaching emphasizes the teacher's role as a facilitator of discovery rather than a provider of information. Students engage with problems or projects that require them to apply and extend their knowledge, while teachers guide and scaffold the learning process.

- Contentless Learning: In a contentless learning environment, students begin with a question or problem rather than pre-defined content. This approach encourages exploration, critical questioning, and the application of prior knowledge, fostering deep and enduring understanding.

- Formative Assessment: Continuous, student-cantered assessment provides real-time feedback and supports iterative improvement. This approach helps students view assessments as opportunities for growth, not judgments of ability.

- Formative Assessment: My approach to formative assessment is unique. In a brain-based, contentless teaching environment, formative assessment is not a separate, static process but a dynamic and continuous element of the learning experience. It drives the facilitation process itself, adapting direction and content based on real-time insights into student thinking and progress. This "in-the-

moment" feedback allows educators to tailor their guidance to the immediate needs of students, fostering a responsive and student-centred learning environment.

Formative assessment necessitates flipped teaching because the real-time insights derived from ongoing assessments allow educators to shift from delivering predetermined content to facilitating exploration and discovery. In turn, flipped teaching—where students actively engage with and construct knowledge—requires formative assessment to guide and refine the learning process. These two elements create a symbiotic relationship, where formative assessment provides the data and direction for flipped teaching, and flipped teaching ensures that assessments are deeply embedded in the learning experience.

Continuous, student-centred assessment provides real-time feedback and supports iterative improvement. This approach helps students view assessments as opportunities for growth, not judgments of ability. Continuous, student-centered assessment provides real-time feedback and supports iterative improvement. This approach helps students view assessments as opportunities for growth, not judgments of ability.

Foundations for Aligning Education with STEM

1. The Imperative of Relevance

Education must prepare students for the realities of the world they will enter. STEM fields drive innovation, economic growth, and societal advancement in the modern era. An education system misaligned with these demands risks producing graduates who are ill-prepared for meaningful contributions. By focusing on STEM principles, education ensures students are equipped to address real-world challenges effectively.

2. The Global Competitiveness Argument

In an increasingly interconnected world, nations compete for technological and intellectual leadership. STEM education fuels this competitiveness by fostering critical thinking, creativity, and technical expertise. Aligning education with STEM not only secures economic prosperity but also positions a country as a global leader in innovation.

3. Evolutionary Epistemology

The alignment of education with STEM can be grounded in evolutionary epistemology, which argues that

human knowledge evolves to adapt to changing environments. As STEM disciplines evolve to address modern challenges, education must adapt accordingly to remain relevant and effective.

4. The Ecosystem of Dialectic Thinking of Formative Assessment and Flipped Teaching

Think of education as an ecosystem. In a STEM-driven world, STEM principles act as the "sunlight" that sustains the ecosystem's energy flow. Without these principles, education becomes like an ecosystem devoid of sunlight—stagnant and unable to thrive. Just as sunlight drives photosynthesis and sustains life, STEM principles energize the educational process, fostering growth and adaptation.

Moreover, formative assessment and flipped teaching exemplify the dynamic cycles found in ecosystems. Formative assessment acts as a feedback mechanism, much like nutrient cycling in nature, ensuring that the "ecosystem of learning" adapts and evolves based on students' needs. Flipped teaching mirrors the interdependence seen in natural systems, where the roles of learners and teachers shift fluidly to maintain balance and growth. Together, they embody the principles of ecosystem thinking by creating a responsive, interconnected educational environment.

In a STEM-driven world, STEM principles act as the "sunlight" that sustains the ecosystem's energy flow. If education fails to align with STEM demands, it becomes like an ecosystem devoid of sunlight—stagnant and unable to thrive.

5. The Ethical Responsibility

It is an ethical imperative to equip students with skills and knowledge that ensure their future employability and ability to contribute meaningfully to society. STEM fields address critical global challenges such as climate change, healthcare, and sustainable development, making their integration into education a moral obligation.

6. The Deweyan Perspective

John Dewey's philosophy of education as preparation for life supports the alignment with STEM. Dewey emphasized experiential learning, problem-solving, and interdisciplinary approaches—all of which are central to STEM education. Aligning education with STEM ensures it serves practical purposes while nurturing intellectual curiosity.

Why Brain-Based Learning Matters for STEM

STEM education stands at the crossroads of innovation and tradition. Brain-based learning bridges this gap by:

- Cultivating Innovators: Students learn to apply their knowledge in transformative ways, creating solutions that address real-world challenges.

- Fostering Self-Regulation: By understanding how their brains work, students can set goals, monitor progress, and adjust strategies for success.

- Enhancing Collaboration: Brain-based strategies encourage teamwork and communication, essential skills in STEM fields.

Conclusion

Transitioning to brain-based learning requires a systemic shift in both teaching practices and assessment methods. Educators need professional development opportunities to understand and implement these strategies. Policymakers must support this transformation by prioritizing formative assessments and reducing the emphasis on standardized testing.

By embracing brain-based learning, we can create an education system that not only prepares students for the demands of the modern world but also inspires them to become lifelong learners and innovators. This is not merely an educational reform; it is a revolution—one that aligns with the natural learning processes of the human brain and the needs of a rapidly changing society.

About the author:

Cas Olivier is an education specialist and author, celebrated for his brain-based approach to teaching and learning that empowers students to unlock and harness their innate Thinking Tools. His innovative methods align with the brain's natural learning processes, guiding math educators beyond the confines of siloed instruction and liberating students from rigid algorithms, methods, and recipes.

By fostering critical thinking, pattern-seeking, problem-solving, and self-regulated learning, Cas equips both teachers and learners to excel in dynamic, real-world contexts where adaptability and deep understanding are essential.

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IoT4 Ag Center is advancing data collection capabilities for rural farms

By Lindsey Berebitsky

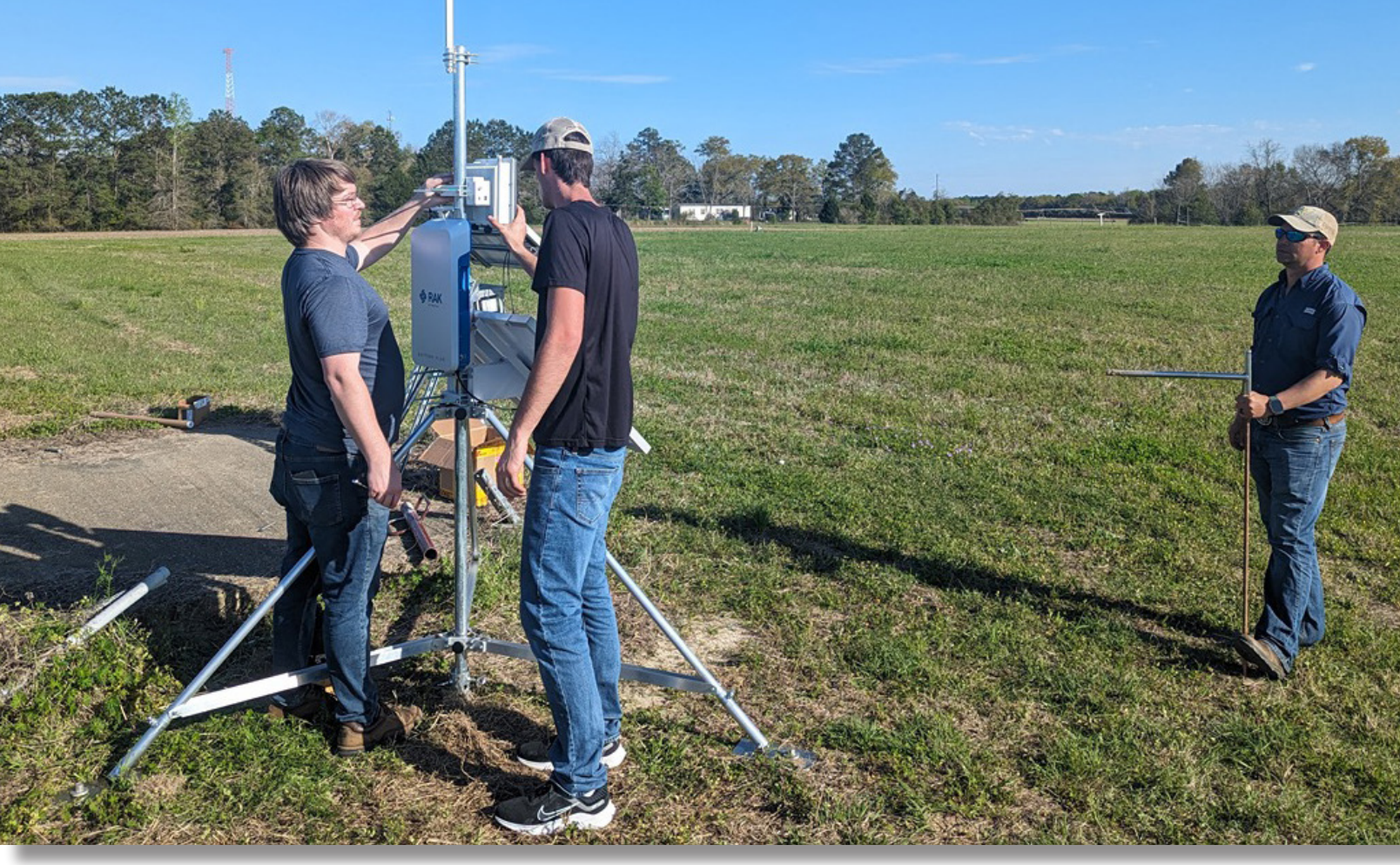
The Internet of Things for Precision Agriculture Center (IoT4Ag), now entering its fifth year, is paving the way for affordable technological innovations that help producers make informed management decisions by collecting data across farms in a low-power, long-range approach with the Solar-Powered Remote IoT4Ag Network Gateway (SPRING) project.

The National Science Foundation has funded IoT4Ag to connect cross-disciplinary scientists from four institutions — the University of Pennsylvania, Purdue University, the University of California, Merced, and the University of Florida —to each other as well as to farmers and industry partners.

The Internet of Things, or IoT, focuses on building connections. Think of how your phone has Bluetooth, which allows it to play music over your car speakers. Or, if you have a smart home, you might be able to check that you closed the garage door before you left from your work computer. The ability of these devices to work together is IoT.

Although agriculture has many high-tech elements, it lags behind many industries in regard to IoT. Rural areas lack access to internet and cellular connections, and the large initial cost of new technologies can make them difficult for growers to adopt. But in the face of climate change, a growing need for traceability and rising costs of production, farmers need IoT now more than ever to gather and access data that informs their daily and long-term management decisions.

Agriculture is the science, art, and practice of cultivating the soil, producing crops, and raising livestock, encompassing everything from farming to the preparation and marketing of agricultural products.



From left, Andrew Balmos, Josh Bailey and Derek Hurley install a device to the top of their SPRING tripod. This system collects data from sensors placed across a field to help farmers and researchers review real-time data from their fields or orchards for management decision-making.

IoT4Ag managing director Bob Brier, of the University of Pennsylvania, said center director Cherie Kagan founded IoT4Ag to help adapt agriculture to the "grand societal changes and needs regarding food, energy, agriculture and water conservation."

The SPRING project built on IoT4Ag's Purdue OATS DataStation (POD) project, which used long-range wide area networks (LoRaWAN) mounted on tripods placed in between crop rows to pull data from sensors across fields. Producers could travel to or virtually connect to the POD(s) to collect soil moisture, weather, grain bin status and other data.

With new advancements, SPRING uses the same LoRaWAN to collect data, but it offers a truly remote possibility using solar-powered batteries. As long as each LoRaWAN tripod can access the internet — via cell modem, Wi-Fi or wired internet connection — it will send data collected from across the farm to the cloud so that producers can access it in real time on their phones and computers.

Andrew Balmos, a lead software and data engineer on the SPRING project, said that unlike other cloud-based software, SPRING was designed with privacy in mind: "We've built an open-source code, and we are making an open-tutorial paper. They teach the user how to bring up the software in their own accounts, like on Amazon's cloud. But farmers are still fully in control of their own data, just like they were with POD."

The IoT4Ag center is developing new low-cost sensors, and SPRING is increasing the accessibility of such technology by using hardware that is available commercially. To save money, farmers can purchase the parts and assemble setups themselves.

"Soon, SPRING setups only exist on research farms," said Dennis Buckmaster, a professor of agricultural and biological engineering at Purdue and an IoT4Ag thrust leader. "But anyone could just replicate these designs on their own and control their data. I think the key power of SPRING is that it's a gateway to getting more sensor data almost regardless of location. The system is scalable. and adding more sensors is simple."

The IoT4Ag center shared this research in a paper presented at the International Conference on Precision Agriculture.

University Of Georgia Agriculture

Agriscience and Environmental Systems students learn to apply knowledge of basic sciences to solve agricultural problems. In addition to learning the fundamentals of agronomy, entomology, plant pathology, resource management, soil science, and business management and marketing, students also learn about new technologies that can be applied to plant and animal production systems such as biotechnology, geographic information systems, and precision agriculture.

The major offers three areas of emphasis: Plant Breeding and Genetics, Precision Agriculture, and Sustainable Agriculture. The major is offered on the Athens Campus and the Tifton Campus.

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Through working with their faculty advisor, students may choose to specialize in a particular area of natural and environmental resource management, including water resource management, conservation, regional or community development, or management of public or private resources. The courses within this major provide students with the necessary background to work effectively with professionals in many fields.

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AI Skills: The New Currency in Today's Job Market

The AI revolution is here. Ever since ChatGPT arrived on the scene in late 2022, artificial intelligence has been reshaping the way we live and work. What does that mean for tech professionals looking to compete in a changing labor market?

TV pundits and talking heads love to get riled up about whether robots are coming for our jobs — but the truth is that AI will probably create more jobs than it eliminates. And one thing's for sure: understanding how AI works, and mastering AI skills, will be the key to success in tomorrow's ever-changing world of work.

New research shows that a growing number of companies are asking for AI skills in job descriptions — including non-tech roles. And a survey of HR professionals released last month shows that job candidates with AI skills ask for more money during the interview process — and tend to get it once they're hired. Simply put, AI is going to be underpinning nearly every job out there. That's why staying ahead of the latest in AI development is so important.

Building AI skills doesn't just mean learning how to engineer prompts for ChatGPT. It's everything from programming to data modeling and analysis to mastering concepts like machine learning and natural language processing. And if there's anything certain in our fast-paced economy, it's that building AI fundamentals today will translate to career opportunities tomorrow and beyond.

That's where SkillStorm comes in. In partnership with TAG, we offer Microsoft Azure AI courses that are instructor-led, career-aligned tech certification courses and will help you build the AI skills that employers need. From the basics of AI and machine learning to a comprehensive understanding of how to design, deploy, and maintain AI solutions, you'll learn everything you need to accelerate a career in the economy's hottest fields.

It won't be long before all kinds of jobs, all across the economy, require AI skills. And starting now is the best way to accelerate your ascent up the career ladder. Build those skills today and you'll lay the foundation for opportunity for years to come — and set yourself up for success in an AI-driven future of work. Register today to get started with a career in tech.

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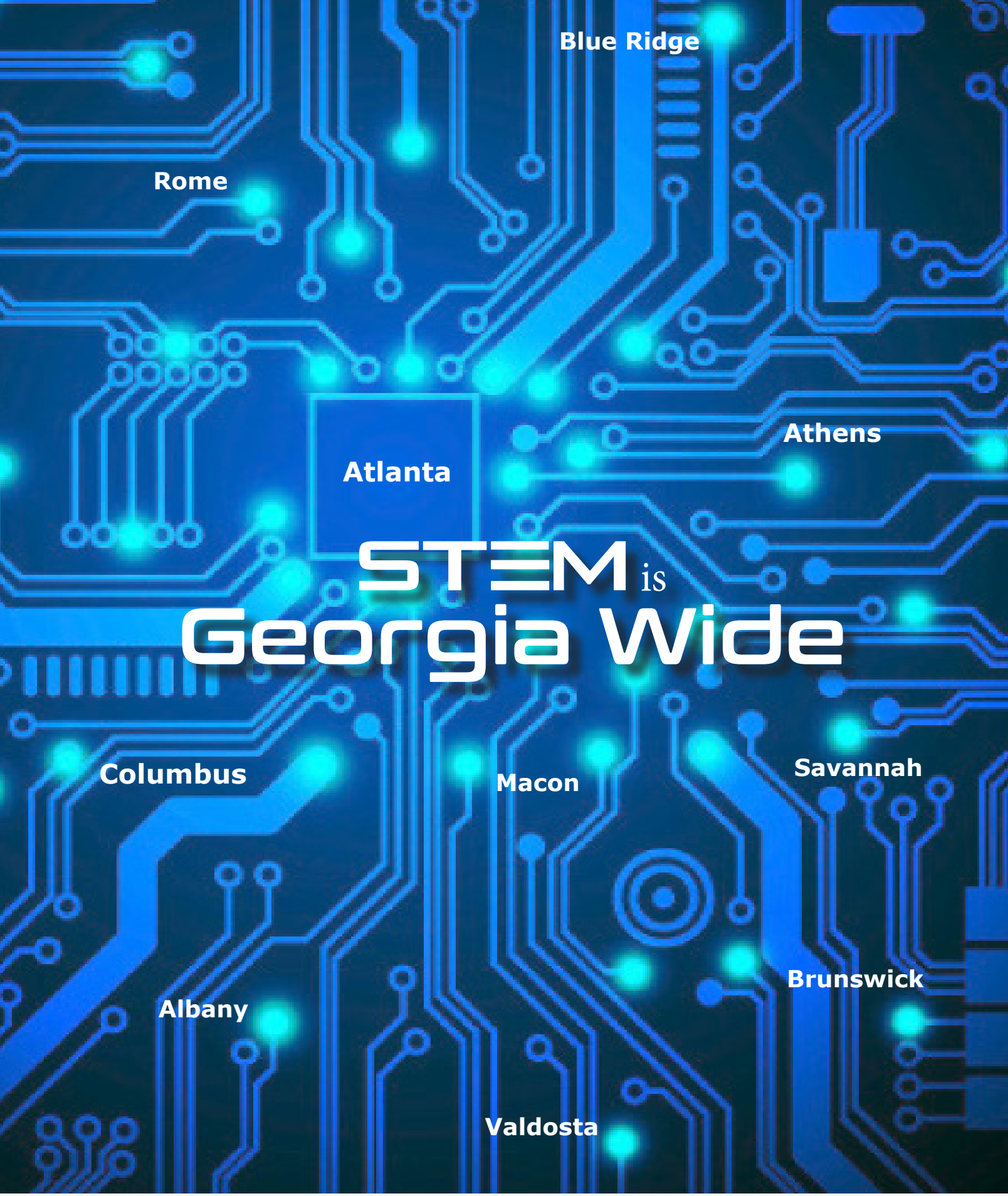

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