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From the airport to the cockpit: How Ohio University has advanced avionics technologies for 50 years

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Find out how Ohio University biologists Mark Berryman and Soichi Tanda are using images like these to understand the role of a key protein in the body. (See story, page 10)
Global connections

As a public research institution, Ohio University is committed to international engagement as part of its identity and mission. Such engagement is manifested in the travel and work of our students and alumni, in international collaborations for research and creative activity, and in attention to the critical problems of our age that are increasingly global challenges.

The issues associated with climate, energy, health, food security, and water command global as well as local attention, with connectivity fostered by the internet and other technology. Ohio University is in the process of updating its global strategy to advance its research mission and better prepare students for their future careers, in accord with OHIO's vision that the transformative experience it provides will enable alumni to become global leaders.

International partnerships are a key means by which OHIO advances its global agenda. Such partnerships often involve individual faculty working with far-flung colleagues, but Ohio University also benefits from major partnerships at an institutional level. Three such longstanding partnerships are with Universiti Teknologi MARA in Malaysia, Leipzig University in Germany, and Chubu University in Japan. These partnerships provide educational opportunities for students and increasingly a means for faculty and students to connect for collaborative research.

The Tun Abdul Razak Chair, sponsored by the Malaysian government, brings noted scholars from Malaysia to the Athens campus for two-year residencies. Scientists at Leipzig and OHIO have for the past 10 years sponsored a highly successful research exchange program, Chemistry and Biochemistry at the Materials Interface. Faculty across a growing number of disciplines are establishing research partnerships with their counterparts at Chubu, a key theme as OHIO leadership celebrates Chubu University’s 50th anniversary.

With the continuing growth of challenges and opportunities with global dimensions, the robust international partnerships Ohio University enjoys will be increasingly important to OHIO in its mission to advance knowledge and culture.

About Perspectives

Perspectives: Research, Scholarship, and Creative Activity at Ohio University is published twice per year by the Office of Research Communications, which reports to the Vice President for Research and Creative Activity. The magazine serves its readers by providing information about the research, scholarly, and creative activities of Ohio University faculty, staff, and students, and about the contributions of university research in general through the publication of accurate and balanced journalistic content that informs, stimulates intellectual discussion, and promotes scholarly inquiry.

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(above) Daiara Faria, a condensed matter theorist from the Universidade Federal Fluminense, Niteroi, Brazil, and Nancy Sandler, a professor in the Department of Physics and Astronomy, discuss a model to describe properties of nanoscopic graphene rings systems. The study of graphene is at the center of the research program carried out between the two institutions. Established in 2011, their collaboration to understand properties of graphene structures with potential device applications is funded by the National Science Foundation’s Materials World Network Program.
Seeds in space

NASA project explores impact of gravity on plants

When NASA’s SpaceX Dragon commercial cargo rocket resupplied the International Space Station in January, its payload included two canisters of seedlings from Ohio University.

A team led by scientist Sarah Wyatt received a $380,000 grant from NASA to pinpoint the genes that control plant responses to gravity. The information could improve our understanding of how plants can be cultivated on long-term space missions.

Wyatt, graduate students Proma Basu and Marilyn Hayden, and collaborator Darron Luesse of Southern Illinois University Edwardsville, will use the germinated seeds of Arabidopsis plants, which are part of the mustard family. By extracting the plants’ proteins, Wyatt will be able to pinpoint the exact genes that control response to gravity.

“Proteins are actually the workhorses of biology,” says Wyatt, a professor of plant biology. “Some genes are regulators or switches that modify expression of others, so if we can find a ‘master regulator’ for gravity, that would be useful.”

The seeds were planted in a petri dish and placed in canisters, then germinated in space. After they sprout and grow a couple of days, the space station crew will apply a fixative that halts the growth process and put the seedlings in a freezer for a few days until they can be returned to Earth.

Using temperature and other environmental data sent to Earth from data loggers flown with the seedlings, Wyatt will replicate the experiment on a 48-hour delay.

The scientist has been working with NASA since 1996, but she still gets a thrill out of sending plants into orbit.

“Figuring out this basic biological question is so exciting,” she says. “Flight opportunity just ramps up that excitement.”

story by :: NATALIA RADIC
New view

Engineers work to commercialize aircraft technology

Engineers now have a new tool to help design and test new aircraft: a 3-D visualization suite developed by a team of Ohio University computer scientists.

The 3-D visualization, which combines existing databases with new data coming from sensors in the aircraft's Global Positioning System and other instrumentation, shows engineers in real time how systems that don’t usually “talk” to each other are communicating—or not. This can increase the efficiency, safety, and affordability of developing new aviation systems.

With support from a grant from the Ohio Third Frontier Commission and Ohio University’s Russ College of Engineering and Technology and Vice President for Research and Creative Activity, the research team will work with the university’s Technology Transfer Office to develop the 3-D software for commercial use.

The project began as part of a National Science Foundation grant seven years ago, but greater adoption of the original software was stymied by its use of C++, a computer programming language that is widely used, but not among engineers, says Professor of Computer Science David Chelberg, the project’s principal investigator.

He worked with graduate students Chad Mourning and Scott Nykl (now a 2013 alumnus) to tackle the problem. “The grant seeks to make the software we developed available to researchers using MATLAB, a popular engineering tool,” Chelberg says. “Over the past seven years, Chad and Scott continued research into this visualization platform during both their master’s and doctoral programs, with other graduate students also contributing.”

The software, which uses 1,000 times less bandwidth than today’s standard for video streaming, already has been used for projects in conjunction with NASA, the FAA, Airservices Australia, MIT, and Princeton, as well as Ohio University’s Avionics Engineering Center.

According to the research team, additional applications abound. “In a snow emergency, municipalities could live-track the location and state of snowplows—for example, a plow’s blade status, a map of paths traveled, how much salt is available—to map paths and minimize fuel costs,” Nykl says.

Other applications include methane leak detection at hydraulic fracturing sites; wildfire management using infrared sensor data to visualize fire paths; and energy management in smart buildings to evaluate airflow between hot and cold spots.

“This can be used in any environment where sensors are present—anything that generates data for an operator to view in a 3-D environment, to oversee and operate it more efficiently,” Mourning says.

Mourning and Nykl since have started a company, Affine Technologies, to develop and commercialize the university’s flight testing software. The company is a client at the Innovation Center, Ohio University’s high-tech regional business incubator.

story by :: CORINNE COLBERT + COLLEEN CAROW
Researchers queried 881 college women in the Midwest on their Facebook use, body image, and eating and exercise habits. The more time young women spent on the popular social media site—perusing peer status updates and photos—the worse they felt about their own appearance.

The study, co-authored by Ohio University Associate Professor of Journalism Yusuf Kalyango, made an international media splash in April, with coverage in at least 138 news outlets, including Yahoo News, BBC World News, NBC News and Today, WebMD, the Huffington Post, and Glamour magazine.

The research examined how often the participants would compare their own bodies and eating habits—drawing from the Eating Attitudes Test and Body Shape Questionnaire standardized scores—to those of their friends through posts and photos. Such comparisons can trigger a phenomenon known as mass mediated objectification, in which consumers try to model their image on what the media present to them, Kalyango says.

“It (happens) from interactive interpersonal masses to masses, friends to friends,” he says. “This can also create inner turmoil because individuals may develop assumptions that they are not as perfect as the image they present to their peers on social media.”

Negative body image was especially prevalent in participants who were trying to lose weight.

“In my opinion, this online social comparison media environment creates a perfect breeding ground for the development of disordered eating, and therefore poses as a risk factor, especially among the highly susceptible group of college women,” he says.

The researchers, who presented their results at the International Communication Association in May, plan to analyze the data further and expand the survey to include college males and women from different parts of the world.

For some college women, spending time on Facebook can lead to poor body image, a new Ohio University study finds.
High school students who want to ace the math section of the ACT should brush up on their reading skills, according to an Ohio University study.

Dywayne Nicely, assistant professor of math at Ohio University Chillicothe, says the link between reading comprehension and math skills seems logical, but it’s also backed up by research. When a student struggles to solve a math word problem, poor reading abilities are often the cause.

But while most solutions to the issue start at the elementary or middle school levels, Nicely wanted to test an intervention at the high-school level.

“Our pitch was that we wanted to get them college-ready,” he says.

With a grant from the Ohio University Baker Fund, Nicely enrolled 63 juniors at Chillicothe High School in his study. He gave the students regular assignments to improve reading comprehension, using online test preparation programs such as Study Island, then set them on ACT-style math questions.

After a course of reading comprehension practice, Nicely found that students in algebra II and pre-calculus improved their math scores by 14.8 percent and 5.4 percent, respectively, over the course of a year.

Those results show that it is never too late to improve high school students’ math skills, Nicely says.

story by :: NATALIA RADIC

ILLUSTRATION: ALIX NORTHRUP; PORTRAIT: JACK JEFFERY, OHIO UNIVERSITY CHILlicothe
from art house flicks to Saturday afternoon popcorn movies, films can act as a mirror to our collective desires and fears. But cinema scholars such as Ofer Eliaz also are fascinated by what they leave out.

Eliaz, an assistant professor of film at Ohio University, has been studying independent and mainstream films made after World War II to find examples of how filmmakers omit or allude to issues that may be too uncomfortable or controversial to address directly. Viewing the issue through the lens of psychoanalysis, Eliaz seeks to offer an alternative to film histories that focus more on the technology, business, or national trends in cinema.

In two published papers and his book in progress *Cinematic Cryptonymies: Figurations of the Unseen Image*, Eliaz discusses the issue of the absent image in conjunction with the psychoanalytic theories of Nicolas Abraham and Maria Torok, who examined how individuals process trauma by absorbing traits of lost loved ones.

Several chapters of the scholar’s work examine French and Italian filmmakers whose movies addressed the public’s unease and unwillingness to fully confront the atrocities of World War II and the Holocaust. The filmmakers used various techniques to emphasize absent bodies—such as people who perished in the war or marginalized people who are omitted from the “cultural frame,” Eliaz says—to essentially give a presence to the invisible.

French filmmaker Georges Franju, for example, made several documentaries and fictional movies such as *Eyes Without a Face* (1960) that depicted grotesque images intended to jolt the viewer and avert eyes from the screen. The genre horror films of Italian director Mario Bava featured murderers that never appeared on camera and shots that came from a mysterious point-of-view. Although none directly concerned the war or Holocaust, the films either evoked the violence of those situations or reflected the lingering but unacknowledged horrors of them, Eliaz says.

The issue of the absent image does not pertain only to war, however. Eliaz points to contemporary filmmakers such as Naomi Uman who use film to discuss how women and migrant Mexican farm workers are marginalized and made to be invisible in society. Uman’s documentary series on the North American dairy industry addresses the problem directly, but her experimental film *Removed* (1999) created a buzz in the art film world for her creative take on the issue. The filmmaker used nail polish remover to blot out the images of women in pornographic movies, Eliaz says, making a direct commentary on how females often appear in films only as the subject of male desire.

“There are different strategies that filmmakers have used that leave a hole or gap in an image that points to the invisibility of bodies in culture at large,” Eliaz says.
Military veterans support unique student medical research program that seeks new diagnostics, treatments for diabetes

"I've been in AMVETS for 45 years, and I believe this project is probably the most important thing we've done as an organization," says Jim King, a former AMVETS national commander and one of several representatives from the group who spoke at the emotional anniversary celebration in Athens. King and others cited a grim statistic: One in four U.S. veterans has diabetes—a rate triple that of the general population, according to the Department of Veterans Affairs. The incidence is even higher among Vietnam War veterans.

The AMVETS Diabetes Institute, as the grant program is called, aims to chip away at the problem by engaging students in research early in their academic careers so they can join the fight against one of the nation's most serious health issues. Of the 32 scholars funded so far, about half have gone to graduate school and half to medical school. Two are now practicing physicians.

To qualify to be an AMVETS scholar, students must hold at least a 3.0 grade point average and have a veteran in their family, or be one themselves. For Kopchick, principal investigator at the Edison Biotechnology Institute who helped launch the AMVETS scholars program, the family research that students put into discovering relatives' military service is just as important as their work in the lab.

“This (AMVETS) grant is unique in a lot of ways," says Kopchick, an Ohio University Distinguished Professor of molecular and cellular biology and Goll-Ohio Eminent Scholar. Kopchick points out that 100 percent of donations to the AMVETS scholars fund goes to support students, avoiding administrative costs associated with traditional grants. The fund is also one of the few that connects undergraduates with research opportunities.

The idea for the program hatched from a 2002 conversation between Kopchick and members of AMVETS Athens Post 76, one of whose family members had diabetes. Was there a way that AMVETS could help with diabetes research? The national organization got behind the effort with a $15,000 donation to launch the scholars program in 2004, and it's been growing ever since.

Ten years later, Kopchick and a handful of veterans watched as AMVETS scholars gave presentations on their diabetes-related research and relatives' military service.

Elizabeth Jensen, who was a student scholar studying cellular and molecular biology, told of her grandfather, Pfc. Dorsey Arnold, who was wounded in Italy in 1944 and later died of complications from diabetes and heart disease. An AMVETS scholar for two years, Jensen delved into the relationship between diet and accelerated aging. She is now pursuing the Heritage College's D.O./Ph.D. program. This program combines training in medicine and research for students interested in becoming physician-scientists, helping to prepare them for...
careers as faculty members at medical schools, universities, and research institutes.

Former AMVETS scholar Adam Jara talked about his own military service as a first lieutenant in an Ohio National Guard medical detachment. Jara, a Heritage College D.O./Ph.D. student just finishing up his Ph.D., talked about his work examining the effects of growth hormone on the heart.

Over the past decade, AMVETS scholars have had a part in more than 150 research papers and have given countless scholarly presentations.

The program has been meaningful for many in AMVETS, as well. Linda McGriff, president of the AMVETS National Ladies Auxiliary, lost her husband, Tom, to complications from diabetes in February. Shortly afterward, she made a donation to the AMVETS Diabetes Institute on his behalf.

“It was a no-brainer for me,” McGriff says. “(My husband) was a champion for this program, and it's been a member of our family.”

Linda McGriff, president of the AMVETS National Ladies Auxiliary, lost her husband, Tom, to diabetes-related complications. She calls AMVETS Diabetes Institute “a member of our family.”

John Kopchick introduces Elizabeth Jensen, an AMVETS scholar who studied the relationship between diet and accelerated aging.

story by :: JODY GRENERET

PHOTOS: JOEL PRINCE, HERITAGE COLLEGE OF OSTEOPATHIC MEDICINE
Ready for a Close-Up

Biologists focus on the role of a key protein in human health and illness

by Andrea Gibson and Philip Barnes

(Above) This image shows a pair of salivary glands from the larva of a fruit fly. The CUK5 protein outlines and provides shape to the cells that make up the developing glands.
Hearing loss. Birth defects. Cancer. What do these medical problems have in common? Two Ohio University biology researchers think that one tiny protein in the body may play a key role in regulating these issues.

The eye-popping photos on these pages show how Mark Berryman and Soichi Tanda have been tracking the role of the protein CLIC5 in the embryos of fruit flies, which are commonly used by biologists to understand how the living body develops—and succumbs to disease.

Berryman discovered CLIC5 in human placenta tissue while studying the proteins that control the structure of cell surfaces. Understanding the variations in cell surfaces can help scientists understand the distinct functions of different types of cells in the body, explains Berryman, an associate professor of cell biology in the Heritage College of Osteopathic Medicine.

Researcher Kenneth Johnson and colleagues at the Jackson Laboratory in Maine later discovered a certain group of mice that were missing CLIC5. The animals under study were deaf and had difficulty orienting themselves in their cages, moving erratically.

For more than 12 years, Berryman and Tanda, an associate professor of biological sciences, have combined their expertise in cell biology and genetics to understand CLIC5, both in fruit flies and in the mice.

Their recent work focuses on the protein’s role in hearing loss, an issue that impacts aging adults, military veterans, and patients undergoing chemotherapy or taking certain medications.

Our inner ears contain sensory hair cells that allow us to hear sound and control our sense of balance. The surface of these cells is covered with stereocilia, tiny antennas that respond to vibrations and send electrical signals to the brain.

It’s the malfunction of these stereocilia that cause human hearing loss. But how, exactly, do these little structures break?

The Ohio University team’s research has shown that CLIC5 supports the biological links between the surface of the cell membrane and the inner structure, or cytoskeleton. In a healthy person, the stereocilia of the cell membrane will stand up straight. Think of placing your hand inside a glove—your fingers give structure to the garment, Tanda says.

When hearing loss occurs, CLIC5 can’t do its job. The links break, and the membrane loses its shape. The glove goes limp.

In a more recent study, Berryman and Tanda, along with researcher Felipe Salles and colleagues at the National Institute on Deafness and Other Communication Disorders, found that CLIC5 doesn’t act alone. It’s actually part of a scaffolding of several proteins that ensure the structure and health of the stereocilia.

These findings add to a growing understanding of the biology of our inner ear, Berryman says, which, in turn, may help scientists achieve a goal of developing a biological cure for hearing loss in the next 10 years.

“In the long term, if we know more about the fundamentals of how the proteins work, this could help other researchers who are working on gene therapy to improve hearing,” Berryman says. “Maybe it could help protect cells against loud noises, make them harder or help them live longer, for example.”

But the CLIC5 research could have implications for other health problems too. Berryman pulls up a series of brightly colored microscope images that show the fruit fly in various stages of embryonic development. As the fly matures, the cells build organs. Berryman points to a bright line that appears to be zipping up the skin along the insect’s back. The zipper? That’s CLIC5.

Understanding how CLIC5 does the job during normal embryonic development could help scientists learn how the protein could be used to understand birth defects or how to heal wounds more quickly.

If CLIC5 sounds like some kind of biological hero, the scientists are quick to point out that this is not always the case. CLIC5 has been shown to also help the spread of cancer cells in the body.

“One interesting aspect of the protein is that it works differently in various biological processes—one is good for us, one is bad,” Tanda says. “It could be considered a double-edged sword.”
EARLY EDITION

PAULINE FREDERICK PAVED THE WAY FOR FEMALE BROADCAST JOURNALISTS

by NATALIA RADIC
WHEN JOURNALIST PAULINE FREDERICK ATTENDED A 1959 UNITED NATIONS CORRESPONDENTS ASSOCIATION DINNER, SHE SAT AMONG SOME DIPLOMATS WHO, EARLIER IN HER CAREER, HAD REFUSED TO BE INTERVIEWED BY A WOMAN. IN FACT, IT WAS THE FIRST TIME SINCE THE EVENT STARTED IN 1948 THAT A FEMALE EVEN ATTENDED. BUT FREDERICK WAS NOW THE PRESIDENT OF THE ASSOCIATION.

A pioneer in journalism, Frederick broke into broadcasting at a time when few women were in its ranks. She set many precedents—she became ABC’s first female full-time broadcast reporter in 1949 and the first woman to ever moderate a presidential debate in 1976—and helped to invalidate notions that women were not credible sources of news.

Marilyn Greenwald, professor of journalism at Ohio University, happened on Frederick’s story by accident, after a colleague told her about a profile of the reporting trailblazer in the Saturday Evening Post. Greenwald spent more than three years researching Frederick’s life and career, which is the subject of her new book, Pauline Frederick Reporting: A Pioneering Broadcaster Covers the Cold War (University of Nebraska Press/Potomac Books).

“I was always intrigued by women who rose to the top in mostly male environments,” says Greenwald, who previously wrote a book on Charlotte Curtis, one of the first female editors of The New York Times. “How did they do it? What were their personality characteristics? Did they have to act like men to succeed?”

Frederick began as a print reporter for the Washington Star in 1946. But as the media environment quickly changed to radio, and eventually to television, Frederick moved to NBC Radio and then to ABC, where she covered politics and international issues. But it took five years for her to actually earn a contract, a period the researcher calls “glorified freelancing.”

News executives worried that the audience would not take Frederick seriously because of her gender. News producers told her to speak in a low voice because, at the time, it was believed that higher-pitched voices were not credible. And because she was the only one on live sets who knew how to apply makeup for the television camera, Frederick often did the job for subjects she later would interview.

Undeterred by gendered industry standards, Frederick persisted. She solidified her reputation for reporting during the Nuremberg trials and on the devastation of postwar Europe. Frederick was greatly distressed by what she saw during her tour abroad, particularly homeless and maimed children, and developed a very anti-war outlook, Greenwald says.

“It was a real turning point in her life,” she notes. In 1953, Frederick joined NBC, where she wrote about the United Nations. She covered the notorious shoe-banging incident by Soviet Union leader Nikita Khrushchev during a 1960 U.N. General Assembly meeting, as well as the death of Secretary-General Dag Hammarskjöld in a plane crash in 1961.

Frederick truly believed in the United Nations as an international peacekeeper that could prevent war, Greenwald says. She was disappointed when the entity failed to thwart global conflicts in the 1950s and 1960s, such as the Korean and Vietnam wars.

Frederick eventually became a household name—NBC’s star reporter, although she would never have boasted about that fact. But, according to Greenwald, Frederick had longed for more than a successful career. Raised in a traditional household in Pennsylvania, she always wanted a family. But her dreams were dashed by a hysterectomy she received as a teenager.

The journalist often was asked in interviews if she would have swapped her broadcasting career for a family and children.

“She said, ‘You know, I really like what I’m doing, but I might trade it for a family,’” Greenwald says. “That was surprising because you expect her to say, ‘Absolutely not!’”

Frederick eventually married at the age of 61. After retiring from NBC in 1974, Frederick continued to report for NPR for four years and became the first woman to moderate a presidential debate in 1976. She died in 1990.

Greenwald describes Frederick as “professional, smart, and well-educated.” She earned bachelor’s and master’s degrees from American University in political science and international law. Most of all, though, Greenwald says, Frederick was a role model for journalists of both genders.

“She was highly ethical,” she says. “She would never cut corners or do something wrong and hope that nobody found out.”

Nor was she a “self-promoter,” Greenwald notes. “With Pauline, it was always about the story; it wasn’t about her.”

Ultimately, though, it is women who should most know her story and remember it, the scholar says.

“In a large sense, she paved the way for others today by simply performing as a professional and doing her job well,” she says. “In a smaller sense, Pauline served as an adviser and mentor to the few women who immediately followed her in journalism. She advised them, for example, to defy stereotypes men had of women.”

(Left) Frederick reported for NBC News at the 1956 Democratic National Convention in Chicago.
FOR 50 YEARS, OHIO UNIVERSITY ENGINEERS HAVE DEVELOPED AVIATION TECHNOLOGIES THAT HAVE IMPROVED HOW WE FLY—WITH MORE INNOVATIONS TO COME
his is the home of the Ohio University Avionics Engineering Center, the only organization of its kind in the United States. For the last 50 years, center researchers have been the Federal Aviation Administration's (FAA) go-to experts for innovation in electronic systems that help aircraft communicate, navigate, and land safely.

“For the first 30-plus years, we didn’t have any peers—we were the only ones doing avionics work,” says Mike Braasch, the Thomas Professor of Electrical Engineering who headed the center from 2007 to 2011.

Although the field has grown, the center remains the nation’s premier avionics research institution.

“We’ve been doing this so long that we’ve built a critical mass of people, infrastructure, and equipment that allows us to do a broad range of research,” Braasch says.

The center was the brainchild of Richard McFarland, an Ohio University alumnus who had been in love with flying since his boyhood in Massillon, Ohio. In 1963, the center was just McFarland and a graduate student. Today, the center encompasses five faculty members with appointments in electrical engineering and computer science, 10 research engineers, and three technical associates, as well as 20 student interns.

McFarland envisioned an institution in which the brightest minds in engineering would solve real-world challenges in aviation. Not long after its launch, the center attracted national attention for its expertise. In 1971, the FAA and NASA created the Joint University Program for Air Transportation Research to advance aviation research. Its members are the Massachusetts Institute of Technology, Princeton University, and Ohio University. The program is still going strong, nearly 45 years later.

The center has been awarded more than $144 million in research grants and contracts since 1963. The university’s Stocker and Russ Endowments fund some offices, hangar space, and other special facilities and equipment needs. The external support comes from the FAA, NASA, aerospace companies, and aviation authorities all over the world that count on the center’s expertise.

And there is a lot of expertise here. If it has to do with national infrastructure supporting aviation navigation, chances are the center created, developed, prototyped, programmed, and/or tested it. Researchers have improved the Instrument Landing System that has been in use since the 1930s and are key players in the development of the Next Generation Air Transportation System (NextGen) that will replace it. Some of the center’s projects—like real-time 3D virtual-reality cockpit displays—sound like science fiction, but they’re approaching reality.

Flight inspections are a big part of the center’s work, too. Engineers often help write the criteria the FAA uses to measure the safety and effectiveness of new technologies, and some participate in the agency’s test flights.
“The FAA performs a standardized final check to make sure everything is as it should be before a technology is authorized to be used by air crews and air traffic control,” says Mike DiBenedetto, who became the center’s director in 2011. “Very seldom does a civilian get to be on an FAA inspection flight, but we have several folks who have been asked along for their expertise.”

The center also has a seat at some important tables; researchers serve as advisors on national and international aviation issues. “Technology comes and goes, but the ability to help the government solve problems, hard problems, is really our greatest hit,” says research engineer Trent Skidmore. “Whatever the technology problem of the day is, we solve it—we have the tools, the people, the math. We can apply all of those tools to solve whatever problem it is.”

“The system that’s landing the most advanced fighter jet in the world is the same technology that’s helping you find the local Starbucks.”

TRENT SKIDMORE

THE CENTER HAS BEEN AWARDED MORE THAN $144 MILLION IN RESEARCH GRANTS AND CONTRACTS SINCE 1963.
In the early 1990s, the FAA began looking at what it calls the Local Area Augmentation System, which would use GPS to guide navigation and landing at a closer range. In theory, a single LAAS installation could provide Category III capabilities (landings with 50 feet of visibility) for every runway at a given airport, making flying safer and more convenient.

Over a five-year period beginning in 1993, center researchers turned that theory into reality. Led by Russ Professor of Electrical Engineering and Computer Science Frank van Graas, the team resolved the problem of multipath, a phenomenon in which an aircraft receives not only the transmitted GPS signal, but also signals that bounce off the ground and nearby structures.

That allowed them to create a system that was precise enough for Category III landings; its effectiveness was proven in a series of test flights conducted between 1994 and 1998. Field testing of the system began in 1999, when a center-designed LAAS was installed at Dallas/Fort Worth International Airport for FAA and NASA evaluation. It took another 13 years before the FAA approved use of the first LAAS installations, at Newark Liberty International Airport and Houston Intercontinental Airport.

"Things in aviation move kind of slow," says Skidmore, senior research engineer at the center. "The technology is always five or 10 years behind what's in the labs. This process is in place because of safety."

Creating the system isn't enough. The FAA must know that the technology will work in all kinds of environments, under all types of conditions, and for all manner of aircraft. And it must work all the time. Based on its experience with LAAS, the center helped write the criteria that the FAA used to certify the installations at Houston and Newark.

Meanwhile, GPS has become ubiquitous. It's now in our cars, our phones, and on our laptops.

"The system that's landing the most advanced fighter jet in the world is the same technology that's helping you find the local Starbucks," Skidmore says.

Skidmore is lending his GPS expertise to the National Coordination Office for Space-Based Positioning, Navigation, and Timing, which collects and analyzes information about military, civil, and commercial GPS usage. The office advises the National Executive Committee for Space-Based PNT—which advises the president.

"A lot of the work at the coordination office occurs because of the need to free up communication bands," says Skidmore, who represents NASA for the office. "Would you rather have some kid download movies on his phone or be safe on a flight?"
For more than 20 years, Van Graas (left) has worked on technologies aimed at using the Global Positioning System (GPS) for navigation and landing. Pelgrum (right), who joined the center in 2009, is exploring backup GPS systems for the FAA’s Next Generation Air Transportation System (NextGen), including an enhancement to worldwide Distance Measuring Equipment (DME) system.

“GPS is instrumental for NextGen, but it’s vulnerable to interference because satellites have limited power, and to severe solar activity, because radio signals traveling through resulting ionosphere scintillations—or turbulence—can fade,” Pelgrum says. “DME doesn’t have power restrictions, and we’re proposing some novel techniques that can dramatically improve DME performance without impacting legacy users—and while staying fully compliant with existing standards and regulations.”
Even the best navigation and landing systems can be stymied by interference from structures—new hangars or terminals at the airport, a warehouse or office building—that distort radio signals. The Ohio University Navigation and Landing Performance Prediction Model (OUNLPPM) is a software program that helps aviation authorities troubleshoot problems with navigation and landing systems, analyze the impact of new real estate developments on those systems, and find the best location for new installations. The center licenses the software to users only if the buyer agrees to be trained by Ohio University personnel.

“If they don't know how to use it, they call me every day,” says Simbo Odunaiya, a senior research engineer who participated in developing the model for the center. OUNLPPM is in use by aviation authorities and aeronautics companies in 16 countries in North America, Europe, and Asia. It's also used by the U.S. Air Force and the Army.
Radar-based air traffic control has been the norm since its introduction in the 1920s. The FAA wants to bring the United States into the 21st century with an airspace system it calls the Next Generation Air Transportation System (NextGen). Automatic Dependent Surveillance-Broadcast is a primary element of that plan. Through ADS-B, aircraft track their own positions via GPS and transmit that data to air traffic control. They also can receive data from nearby aircraft. ADS-B gives pilots of equipped aircraft more information at their fingertips about weather, air traffic, and terrain, all in real time.

Center researchers have been working with ADS-B since 1999, when the FAA asked the center for its help in testing and demonstrating early prototypes. Since then, the center has tested ADS-B for NASA and aerospace contractors as well.

More recently, the center has helped the FAA as it introduces ADS-B across the United States. Two center researchers have flown nearly 1,400 hours all over the country to test the availability and accuracy of ADS-B signals.

“The flight evaluations we performed augmented FAA flight inspection efforts, reducing the time to implementation,” DiBenedetto says. “Having such a role speaks favorably to the level of trust the FAA has for Ohio University—organizations outside the FAA are seldom given such critical evaluation roles.”
Your pilot has a six-pack in the cockpit. Not alcohol; not a washboard stomach—the set of six dials that indicate the aircraft’s position and speed. That same setup has remained the same since the late 1920s, even though most modern airliners have LCD screens instead of individual gauges.

Center researchers are working to ditch the six-pack in favor of a new advanced display for Synthetic Vision, an existing technology created by NASA and industry that combines satellite topography databases with GPS to show pilots a real-time, 3-D image. The display, created through a collaboration between Maarten Uijt de Haag, the Edmund K. Cheng Professor of Electrical Engineering and Computer Science, and Erik Theunissen of Delft University in The Netherlands, is designed to greatly improve safety, particularly for small aircraft flying in bad weather.

While fatal crashes of commercial airliners have been virtually eliminated in the United States (the last fatal crash involving a major domestic airline was in 2001), 432 people were killed in general aviation crashes in 2012 alone, according to the National Transportation Safety Board.

Synthetic Vision could display all types of information for the pilot: the terrain, nearby air traffic, the weather farther ahead in the flight path. The trick is determining what information will be most useful and when—without confusing or distracting the pilot.

Center engineer Tony Adami and Uijt de Haag have created a system to test Synthetic Vision displays. They wrote computer code that combines commercial flight simulation software with their Synthetic Vision and other display algorithms.

“We can put a pilot in the simulator seat and say, ‘Try this maneuver using this information versus that information,’” Adami says. “We might simulate bad weather; we might turn off the simulation display so they can see only the Synthetic Vision screens.”
Unmanned aerial vehicles (UAVs) have great potential in the domestic market. Farmers and ranchers could use them to check on crops and livestock at the farthest reaches of their land. Realtors could show potential buyers aerial photographs of properties. Instead of engaging in dangerous high-speed chases, law enforcement could track a fleeing suspect from the air. Fire officials could get live views of a forest fire, allowing them to warn their crews when the flames endanger them. And of course, Amazon.com wants to deliver your books via UAV.

UAVs are essentially more sophisticated versions of the radio-controlled model airplanes you might have flown as a child. But those models are always in your sight. To make UAVs safe for civilian use, engineers have to find ways to overcome multiple challenges.

“A UAV’s primary purpose isn’t to transport people or things; it’s usually to collect information, take pictures, and so on,” says Braasch. “At certain points it may hover or fly in circles. That changes the analysis because you’re not spending the bulk of the time in straight, level flight like a manned aircraft typically does.”

Some center researchers use the center’s Brumby UAV, which can fly more than 100 miles per hour for up to 60 minutes. It already has been equipped with a GPS receiver and a special data link to send navigation information back to the pilot. Others, such as Adami and Professor Jim Zhu, are working with the Galah and Telemaster vehicles to develop an advanced flight controller that would make UAVs completely autonomous in flight. The user would need only to tell the aircraft where to go and monitor its flight, without operating a remote control.

Zhu and Adami’s work has applications to manned aircraft as well. “Traditional autopilot is designed to relieve the burden from a pilot or to maximize fuel efficiency, but they’re not valid for anything other than normal flight,” Adami says.

If flight conditions change and the plane flies at an excessive pitch-angle, for example, the human pilot has to resume control from a traditional autopilot system. But Zhu and Adami’s algorithm can accommodate nonlinear flight. The same technology could go into rockets and other space vehicles, Adami says.

Mike Braasch

“We’ve been doing (avionics engineering) so long that we’ve built a critical mass of people, infrastructure, and equipment that allows us to do a broad range of research.”
Unusual portraits reveal a historic moment in American photography
During the seven months that Laura Larson waited to adopt her daughter from an orphanage in Ethiopia, she came across the hidden mother photographs. The images on tintypes, created in the late 19th century, featured a series of women obscured by curtains, tablecloths, or furniture while they held squirming infants still for portraits.

“To me these were so poignant, really funny, and really disturbing, either because of the child’s expression or the fact that the mother’s face is scratched out,” recalls Larson, an associate professor of photography at Ohio University. “The material was so emotionally rich. The photographs connect you to the subject matter, but they push back, too.”

Larson began conducting research on the historical images and connected with Indiana photography dealer Lee Marks, who has collected almost 600 hidden mother photographs over the last 20 years. The work inspired Larson to curate an exhibition of these historical images and write a book that incorporates the photos, with a narrative text that weaves in her own experience of the anticipation of motherhood.
The Hidden Mothers project is traveling to several venues over the next year. It debuted at the Blue Sky Gallery in Portland, Oregon, in August 2014. In 2015, the Palmer Museum of Art at Penn State University and the Allen Memorial Art Museum at Oberlin College will host the show. In the meantime, Larson is working on securing a publisher for her companion manuscript. The project was funded in part by a grant from the Ohio University Baker Fund.
Because the photographs required long exposure times, shooters had to work with the mothers to come up with creative solutions to hold the child still while the adult remained out of frame.
COMMUNICATIONS SCHOLAR DEVika CHAWLA EXPLORES HOW GEOGRAPHIC DISPLACEMENT, IMMIGRATION IMPACT OUR SENSE OF HOME
The idea of “home” is fraught with meaning. The desire for a place where we are accepted and where we belong is embedded in the human soul. And the loss of home can cause psychic wounds that last generations, especially when that loss is traumatic.

Devika Chawla addresses such loss in her new book *Home, Uprooted: Oral Histories of India’s Partition*. Through firsthand oral histories of three generations affected by Partition, Chawla explores how the idea of home echoes through these individuals’ lives and shapes the way they view themselves.

“Home is a historical idea and situation that is made up of and makes up our identity,” says Chawla, an Ohio University associate professor in the School of Communication Studies. “In my view, the conceptual purchase of the book lies in its illustration of how thinking about identity has evolved over the last few decades.”

*(Left) Chawla describes this British-made metal box, which traveled with her paternal grandmother from Pakistan, as “a material symbol of my family’s politically impelled migrations.”*
One of 30 special trains prepares to leave New Delhi Station, taking the staff of the Pakistan government to Karachi. Muslim League National Guards stand to attention in honour of the departure.

PHOTO: KEYSTONE FEATURES / GETTY IMAGES

Muslims wait to leave for Pakistan as they seek protected transport to Dot Purana Qilla, an ancient fort in Pakistan, where many refugees had gathered.

PHOTO: POPPERFOTO / GETTY IMAGES

A distraught boy sits on the walls of a refugee camp in Delhi during the Partition of India.

PHOTO: UNIVERSAL HISTORY ARCHIVE / UIG VIA GETTY IMAGES
NEITHER HERE NOR THERE

In 1947, the British Indian Empire was split into two independent countries: Muslim-majority Pakistan and India, majority Hindu with large subpopulations of Sikhs and Jains. It is estimated that up to 20 million people moved across the new border in the largest mass migration in history. As many as one million more were killed in sectarian violence, which accompanied Partition.

Among the Pakistan Hindus who fled to Delhi was Chawla's father, Sudhakar Chawla, then a boy. He introduced her to some of the 45 people she interviewed for the book. But she didn't start out intending to write about home.

"I started with a much broader question: how does the Partition live in the everyday stories told across three generations of Partition families?" Chawla says. "As the fieldwork continued, participant after participant made home a center of their oral history performances."

In the book's introduction, Chawla describes the different ways scholars have defined home, often in the context of domesticity (a safe haven) or travel (there vs. here). But for the people whose stories are told in Home, Uprooted, home remains a fluid concept.

"They might be defined as nomadic owing to the watershed moment that displaced them and the persistent discontinuities that shadowed some of their lives," Chawla writes, "yet they all inhabit and locate home in a multitude of ways—never fully settling into any singular articulation of home."

For example, one chapter shows how some women consider their pre-Partition lives "nothing," preferring to focus on the home they built in India. In contrast, another chapter describes men whose nostalgia for their lost homes in what is now Pakistan haunts even their dreams.

Behind all their stories is a lingering question of what might have been—for good or ill.

"It is like losing a limb ... like you've lost a life that you would love to live over again," says Kiranj, a Sikh woman in her late 80s. "But, would I be where I am or be what I am, had I not lost this home? I don't know the answer to that."

In Kiranj's case, Partition meant a life of economic freedom she would not otherwise have had.

"Her life story shifted after Partition, because the same values didn't hold once families were displaced materially, emotionally, and financially," Chawla says. "Once this system fragmented, women like Kiranj, who were well-educated, found themselves thriving in professional environments. In her case, Kiranj became the founder of a very famous private school in New Delhi."

A SORT OF HOMECOMING

The theme resonated with Chawla particularly because of her own move from India to the United States. As she was working on her book, she became a U.S. citizen. "My own family history and my self-propelled migration to the United States had probably attuned me to listening, feeling, and sensing home," she says. "So I want to say it was an emergent thematic as much to do with my participants as with me, the native ethnographer."

Chawla's family story is woven throughout the book, and many of its most moving moments are deeply personal. It opens with Chawla describing her relationship with her paternal grandmother, who was born in what is now Pakistan; it ends with an interview with her father and meditations on her own life in Appalachian Ohio. This final chapter, "My Father, My Interlocutor," is her favorite.

"In a way, it tells the story of how the book, the project, and the idea came into being," she says. "It is part reflection, part my father's oral history, and part the story of the fieldwork of the project. The chapter wrote itself in a week after all others were complete."

Home will be a theme in Chawla's work for some time. With Stacy Holman Jones of California State University, Northridge, she is co-editing a collection of essays for Lexington Books titled Storying Home: Place, Identity, and Exile. She also is writing an autobiographical piece on the relationship between habits and home and planning new fieldwork to explore the concept of home among the descendants of former colonizers and the colonized.

"Identities, while ever-changing, are products of historical and colonial circumstance," Chawla says. "Thinking about identity in and through the frameworks of home and travel frees it from the stranglehold of category-based identity politics such as race, class, sexual orientation, and so on. While all these categories are real and defining, they might not be the only ways that people experience their selves."
Faculty offer expertise for leading news stories

compiled by ::
JENNIFER KRISCH AND
ANDREA GIBSON

illustration by ::
ALIX NORTHRUP
WHAT HAPPENED TO MALAYSIA FLIGHT MH370?

The mysterious disappearance of a Malaysian passenger jet in spring 2014 sent media outlets into a frenzy of speculation about the probable fate of the aircraft. Wouter Pelgrum, Rob Thomas, and Maarten Uijt de Haag, aviation technology research experts in the Russ College of Engineering and Technology, all spoke to media outlets about how the plane could have changed course without air traffic control noticing, why passengers may not have made distress calls on cell phones, or why tracking devices or a “black box” couldn’t be found. Their commentary appeared in media outlets such as Slate.com, the Toronto Star, and Stars and Stripes. (To learn more about the university’s aviation research, go to page 14 of this issue.)

CHANGES IN COLLEGE SPORTS

David Ridpath, an associate professor of sports administration in the College of Business, is an expert on policies, regulations, and the economics of college sports. In June, Ridpath weighed in on the financial impact of the five wealthiest football conferences asking for more autonomy from the National Collegiate Athletic Association (NCAA) in enacting and enforcing rules. His expertise appeared in USA Today, The New York Times, Yahoo! Sports, and dozens of other national news outlets. In April, CNN and other media reported that Ridpath and colleagues have begun a study on how the NCAA handles academic fraud in college sports.

THE ROLE OF MICHELLE OBAMA

Media outlets have been tapping the First Ladies expertise of Katherine Jellison, professor and chair of history in the College of Arts and Sciences, to comment on the activities of First Lady Michelle Obama. In March, the historian told the Washington Post that it wouldn’t be prudent for Obama to make any controversial statements while visiting China given that the president was being criticized at the time for his handling of the conflict in the Ukraine. Her comments appeared in several other media outlets in China and the United States, including in the Denver Post.

COULD GLOBAL CONFLICT HEAT UP?

The United Nations released a report in March warning that climate change could weaken world security. Shifting weather patterns can impact agriculture and water supplies, for example, which, in turn, could increase political conflicts as people struggle over dwindling resources, the report noted. Geoff Dabelko, a professor and director of environmental studies for the Ohio University Voinovich School of Leadership and Public Affairs, was one of the lead authors on the climate and security chapter of the report. The findings were covered by more than 230 media outlets worldwide, including the Associated Press, ABC News, the Atlanta Journal-Constitution, and Miami Herald.

NIGERIAN KIDNAPPING

When Nigerian militant group Boko Haram kidnapped more than 250 school girls in the spring, some media outlets called Brendan Kendhammer, an assistant professor of political science in the College of Arts and Sciences. Kendhammer, an expert on Nigerian politics, weighed in on the Nigerian military’s ability to recover the children, as well as the potential impact of U.S. military involvement. His comments appeared in articles published by various BBC affiliates, as well as in Huffington Post Canada and CBC News.

AN ARTIST’S INFAMOUS STINT IN CANADA

In June, Newfoundland, Canada, celebrated the 100th anniversary of artist Rockwell Kent’s infamous stint in the seaside town of Brigus. Kent moved to Canada in 1914 to paint and start an art school, but allegedly was told to leave after 17 months. The artist had generated controversy by leading his neighbors to believe that he was a German spy; reports of a mistress and an illegitimate child didn’t help his reputation. As part of the coverage, the Canadian press tapped the expertise of Frederick Lewis, an associate professor of media arts and studies in the Scripps College of Communication who spent 10 years studying Kent’s storied career for a documentary film on the artist. Lewis acknowledged that Kent, an acclaimed painter and illustrator, led a colorful life of travel, political intrigue, legal dramas, and love affairs. His comments appeared in media outlets in Canada, the United States, and Europe, including the Vancouver Sun, Chronicle-Journal Ontario, and Alaska Highway News.

Read more about Ohio University’s faculty experts in the news at http://www.ohio.edu/ucm/media/experts/.
Creating cool new tech products while you're still in your college dorm room is no longer a novelty.

Entrepreneurship programs have exploded on campuses over the last decade. Ohio University not only created a Center for Entrepreneurship that offers a curriculum for budding CEOs, but has supported a wide number of special programs and events designed to help college students launch new technologies and companies.

Take Startup Weekend, a special event that invites young entrepreneurs to pitch a tech business idea, form a team around it, study the market for it, and propose a plan and prototype all in 54 hours. With the help of a cadre of business mentors, some of these entrepreneurs who have attended the Ohio University editions of the event launched apps on iTunes within a year. Others further developed their products and startup business plans with the help of in-depth programs such as the Innovation Engine Accelerator, a summer boot camp sponsored by the university and private partners.

And who pays for the marketing research, product development, necessary hardware and software, the legal advice? While entrepreneurs certainly turn to their own pockets—or, increasingly, friends, family, and sympathetic supporters on crowd funding sites—they also have been able to gain financial help from university programs that range from the Center for Entrepreneurship's Pitch Your Plan competition to TechGROWTH Ohio, a university/private partnership in Southeast Ohio that can award larger grants to promising startups. The Innovation Center, the university's small business incubator, offers digital media companies access to high-end design software and professional iMacs, as well as a space where they can work collaboratively, says Director Jennifer Simon.

In the wake of the latest recession, starting your own company and being your own boss is appealing to more people, and Ohio University students are no different. Startup companies and new technologies aren't a sure bet, however, as plenty fail to get off the ground.

But Simon and Center for Entrepreneurship Director Luke Pittaway note that the university's focus on Lean Startup methodologies—a nationally recognized approach developed by entrepreneur Eric Ries—helps students focus early on whether their product idea has a true market. By conducting focus groups with consumers and research on competitors, student entrepreneurs can refine or change their concept early on to increase their chances of developing a product that meets a consumer need and launches a successful business.

“These student-led ventures are consequently investment-ready and attracting attention from investors and accelerator programs in Ohio.”

In January 2014, Gartner, Inc., a leading technology research and advisory company, predicted the mobile app industry would grow to $77 billion in 2017. And for Ohio University students, finding examples of Bobcats who made the leap from South Green to Silicon Valley isn't hard. Alan Schaaf developed the popular image sharing site Imgur while an undergraduate in the Russ College of Engineering and Technology. Just five years after graduation, he's running a business in San Francisco that just scored a $40 million investment from venture capital firm Andreessen Horowitz.

Not every student idea will be the next Imgur, but more and more students are trying their hand at developing new technologies with an eye to business. On the following pages, we spotlight teams of students and alums who were working with Ohio University programs in 2014 to launch new apps and software products.
TECHNOLOGY: Auger, a mobile app that can calculate your location and notify friends with smartphones where you are. Users also view specific metrics, such as the vital signs of a particular contact, which makes the app a viable product for firefighters, police officers, and even Secret Service agents, Christian Sagardia says.

DEVELOPMENT: The app is developed for Android phones, but Sagardia hopes it will expand to iOS as well. The team chose to develop the platform as a mobile app to make it consumer-friendly. “We're trying to make our system run just on a smartphone,” Sagardia says, elaborating that other similar products require custom hardware, which can be expensive. “Let’s just allow people to use the technology they have in their pockets.” The product is in the prototype stages. The team is working on how to optimize battery life for the app, as well as increasing GPS, triangulation, and WiFi strength. It will first be developed as a consumer technology, similar to FourSquare, which Sagardia hopes will validate the product further for more technical uses.
TECHNOLOGY: RapChat allows users to record 15- to 30-second audio messages, in the form of raps, over a pre-made beat and then share the messages with friends. Building on the concept of Snapchat—a popular photo-sharing app that deletes the message after it’s been opened—RapChat encourages rap lovers to get creative with their messages. Users can have rap battles with friends or just send funky messages.

DEVELOPMENT: The app released on the iTunes store in June 2014; as of August it had 2,200 downloads, Seth Miller says. Though developed for the general public, Miller hopes to target the rap and hip-hop music community. Later versions of the app will include a “beat store” for different beats and other applications for customizing mixes. “We see ourselves changing the way people in the hip-hop and music industry share music,” Miller says, explaining that he hopes the app will ease the process of producing rap music, while establishing a larger network of rap music enthusiasts.

(Right) Seth Miller has worked with alumnus Brandon Logan on a music-focused app called RapChat.
TECHNOLOGY: LiveIn is a mobile app that organizes local event listings—especially for those living outside of big cities, such as Ohio University students in Athens. “There are so many things going on in this small town. We want to be one of the first to start and build this,” Sicong Li says.

DEVELOPMENT: Li and Startup Weekend teammates released their product on the iTunes store in early April 2014. The app helps users discover and post events by connecting them with friends through Facebook, Twitter, and e-mail, as well as a LiveIn friend list. Event organizers can track participation, feedback, and photos. The app was designed for Athens, but the Live Interactive team hopes to expand the app first to the Ohio State University and Columbus area, and then eventually to college towns on both the East and West coasts.

AM/PM is a mobile app that allows users to send automated voice memos to an entire contact list. The app also features a clock-in/clock-out element that encourages users to send managers voice memos detailing daily accomplishments. The target audience is businesses with project managers or tech departments. “What we're implementing for business has been used by consumers a lot, like Snapchat that has automatic sending features,” Mitch Suchan says. “It’s used to move information up the chain of command.”

DEVELOPMENT: The app is in the beginning stages of development, and will be created for Android phones first. Suchan hopes to release the app in 2015.
AT A Glance

:: A PREVIEW OF STORIES INSIDE THIS ISSUE

CELL BIOLOGY

:: Close-up role

Biologists focus on the role of a key protein in human health and illness

COMMUNICATION STUDIES

:: Finding home

Scholar Devika Chawla explores factors that impact our sense of home

TECHNOLOGY

:: Starting point

Student entrepreneurs move ideas into the marketplace