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The beginning of each research story usually starts with a compelling problem that needs to be solved or a captivating issue that deserves scholarly attention. The narrative often culminates with researchers developing novel solutions and new insights that lead to additional problems demanding further investigation and interpretation.

Many Kent State University faculty members are writing their own research stories as they work to solve major global challenges in healthcare, energy and education. Some take a team approach by partnering on innovative, interdisciplinary initiatives in healthy aging, flexible electronics, neuroscience and water, among other areas.

For example, researchers from eight different colleges at Kent State (Architecture and Environmental Design; Arts and Sciences; Business Administration; Communication and Information; Education, Health and Human Services; Nursing; Podiatric Medicine and Public Health) recently collaborated on an inaugural healthy aging symposium entitled, “Life in the Balance: Fall Prevention from Multidisciplinary Perspectives.” This event featured leading-edge research and interventions on preventing falls in community, home and healthcare settings.

Another great story that is unfolding involves research faculty in the College of Podiatric Medicine, the Liquid Crystal Institute and the School of Fashion Design and Merchandising who are working together to develop a novel “sensor sock” for inhibiting foot ulcers, the major cause of all diabetes-related lower-leg amputations.

The Kent State University research projects represented in this edition of Research for Life are also positioned at the critical nexus between scholarship and storytelling. They attempt to answer such diverse questions as:

- What can new 3-D imaging technology tell us about the brain’s story?
- How does where you’re born affect your life story?
- What stories do big data reveal?
- How do forensic anthropologists unearth stories of anonymous murder victims?
- Why is the U.S. Civil War still a source of endless stories and re-enactments?
- How did people share their ongoing life stories in the pre-Twitter age?
- Why is it crucial to learn politics outside of books?
- How did an accidental discovery in the lab lead to the launch of a new company?

We invite you to explore these and the many other fascinating stories of research, scholarship and creative activity that faculty, students and staff are writing and telling to the world each and every day at Kent State University.

Beverly Warren, Ed.D., Ph.D.
President

Grant McGimpsey, Ph.D.
Vice President for Research

Great research tells a fascinating story.
The pastoral photograph taped to the wall outside Tyner’s office is fairly unassuming. The image shows Tyner, a Kent State geography professor, and a group of people gathered around a shallow pit in a Cambodian rice field. Tyner, Ph.D., recounts in vivid detail the stories of a local farmer who brought him to the rural site.

The farmer led Tyner to the location, searching for a former Khmer Rouge prison. The pit was actually part of a mass grave where prisoners murdered between 1975 and 1979 by the Communist Party of Kampuchea, otherwise known as Cambodia.

“The prisoners were detained in the prison, tortured, interrogated, and they would have been marched—blindfolded, hands tied behind their back, out to this field, and they were summarily executed there,” said Tyner, retelling the farmer’s story.

Tyner has made many expeditions to Cambodia as part of his research on the violence that occurred in the country during the Khmer Rouge era. The “killing fields” in Cambodia are documented by the Documentation Center of Cambodia (DC-Cam) piece by piece including sites such as Choeung Ek. Below left, Khmer Rouge soldiers. Right, inset, skulls from a mass grave in these photos: Below left, Khmer Rouge guards and soldiers. Right, inset, skulls from a mass grave.

For Tyner, geography must be more than a spot on the map. It’s about understanding the relationship between violence and space and violence.

“The inspiration or experience that comes from that is not tourism but to experience places in their everydays,” Tyner said. “We would travel around and begin to see relationships between the different objects in the landscapes.”

Tyner studied geography in college and received his Ph.D. from the University of Southern California in 1995. After receiving his doctorate, Tyner worked as an instructor and lecturer at several California universities and started to receive research funding. Tyner used part of the NSF funds to bring two Cambodian students to Kent State who later studied for their master’s degrees. The students, Savina Sirik and Sokvith Keo, are enrolled in the geography program at Kent State. They were selected based on their knowledge of the Cambodian genocide.

Perhaps even more rewarding are the opportunities his research has brought to the Cambodian people. Tyner traced his interest in geography to his parents, who were both geography teachers. When Tyner was a child growing up in California, his parents took him on road trips across North America as his father prepared for fall classes. They took pictures of grain silos and corn fields rather than tourist attractions. “The inspiration or experience that comes from that is not tourism but to experience places in their everydays,” Tyner said. “We would travel around and begin to see relationships between the different objects in the landscapes.”

The structures are either directly or indirectly related to the violence. Tyner said that it begins with the regime’s production through irrigation. The regime forced millions of people into the countryside to work on the irrigation regime, which included the construction of dikes, canals and dams. The Khmer Rouge also built prisons to discipline workers and created mass graves. Some of these sites no longer exist.

As part of his research efforts, Tyner interviews Khmer Rouge survivors or residents who lived during the period. He also uses GPS technology to map the locations. He encounters with the local residents bring to life the horrific things people in that area experienced. The farmers who led Tyner to the mass gravesites occasionally unearth bones as he prepares his fields to plant rice. Tyner remembers asking the farmer what he does with the bones.

“He said, ‘Well, I say a little prayer for them, and then I bury them in my field.’” Tyner said. “What else is he going to do? It’s that day-to-day living with the legacy of violence. And this is something that our students can’t relate to.”

One of Tyner’s primary goals as a professor is to raise his students’ awareness and understanding of violence in society by sharing these stories. He’s also taken two of his students to Cambodia to conduct field research.

In addition to his research on Cambodia, Tyner has published geographical works on topics ranging from black radiation in the U.S., to violence, and its associated landscapes for more than 20 years. In addition to his research on Cambodia, Tyner has published geographical works on topics ranging from black radiation in the U.S. to the exploitation of indigenous Filipinos workers.

Geographer puts deaths of approximately 2 million Cambodians together the locations and conditions that led to the period. He also uses GPS technology to map the locations. He encounters with the local residents bring to life the horrific things people in that area experienced. The farmers who led Tyner to the mass gravesites occasionally unearth bones as he prepares his fields to plant rice. Tyner remembers asking the farmer what he does with the bones.

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PROFILE: MARCIA LEI ZENG

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When the county coroner calls, Linda Spurlock sharpens her drawing pencils. As a forensic artist, she has undertaken hundreds of reconstructions of лица from missing persons posters and newspaper clippings. Spurlock, Ph.D., in 11 years of reconstructing faces from skull remains, she has reconstructed the facial features of over 1,000 individuals. Her work has been featured in scientific journals such as "Science," "Nature," and "Anthropological Science." She is known for her "forensic art and illustration," which combines forensic reconstruction with artistic expression.

"I love doing this. It takes your scientific training as well as artistic training," said Spurlock, who joined Kent State in 2012 as an assistant professor of anthropology in the College of Arts and Sciences. "Where science and art overlap, there's a moment when you can educate people."

As a biological anthropologist and a professional archaeologist, her work has appeared in scientific journals such as "Science." It might also appear on the website of the International Center for Unidentified and Missing Persons (The DOE Network) or on a police flyer. "I'm hoping the proportions are good enough to jog someone's memory," she said.

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Recall reconstruction, her specialty, can narrow the search for a missing person or unidentified victim, since people are most likely to recognize a face. From skeletal remains, she can discern the shape, size and age of a person and even a hairstyle or visible birthmark. But the face yields other identifying clues. The skull shows if the eyes were wide-set or narrow, the size of the cranium and the breadth of the mouth. The nasal spine - the bone under the nose - determines how much the nose projects, its slant and length. She keeps her sketches deliberately ambiguous, possibly offering two versions of the same face.

"I'm hoping the proportions are good enough to jog someone's memory," she said.

Her reconstruction of a pelvis of the 4.4 million-year-old "Ardi" skeleton, or Ardipithecus ramidus, earned her co-authorship of a paper written by Kent State distinguished professor C. Owen Lovejoy, Ph.D., for a special edition of "Science" magazine on Oct. 2, 2009, describing the "Ardi" fossil and its significance. In 11 papers in that issue, Lovejoy and other scientists described the hominid remains, the earliest found to date, as the first human ancestor yet discovered who was capable of walking upright. The pelvis reconstruction as "my way of keeping in the art world." "You learn so much about what you're asked to depict," she said.
New books about it, even academic
titles, far outshine other history topics. Civil War books
from a significant part of the publications list at the
Kent State University Press. Civil War History is a
premier scholarly journal that is owned by the press and
goes up to 60 submissions a year, of which it can publish
only 10, said Kevin Adams, Ph.D., associate professor of
history, and the journal’s associate editor.

“We cannot get enough of the Civil War,” said
Leonne M. Hudson, Ph.D., associate professor of
history who teaches the subject. “It was the most revolutionary
and transformative event in the nation’s history.”

Research about the war continues to uncover new
information and smooth new questions. Civil War
History had its biggest blockbuster article just two
years ago, covered by The New York Times and National
Public Radio (NPR). A demographic historian from
Minnesota examined newly digitized records of the
1860 and 1870 censuses and tripled the traditional
estimate of 600,000 men killed in the war to as high as
750,000 or even 850,000.

The effect on the country, then with a total population
of around 30 million, was huge. As NPR pointed out,
its equivalent of 7.5 million men dying in a war
today, when our population is 10 times higher.

That the war continues to reverberate and raise
questions doesn’t surprise Fred Endres, Ph.D., emeritus
professor of journalism and mass communication and
a documentary filmmaker. The graves of the war’s
soldiers are found in cemeteries throughout Portage
County. He has visited them and read the soldiers’
letters, kept by their families through the generations.
His 2013 documentary, “The Sojers of Portage
County,” tells the stories of some local volunteers.

While their stated reason for fighting was to save
the Union, “They didn’t know what the Union was
they had never traveled more than 20 miles out of
Rootstown, Ohio,” he said.

They soon found out. They did not like the customs
and lifestyles of other farm folks as close as Kentucky,
according to their letters. And they quickly discarded
any romantic notions of war.
“There is nothing civil about this war but the name,” wrote a soldier from Franklin Mills (now Kent). “There is new interest in the far West, such as debates in the University of Iowa. Hubbell also is emeritus director for 35 years. He brought the journal to Kent State in the 1960s, a few years after it was founded at the University of San Francisco over whether California should be a free or a slave state. Hubbell said the continuing interest in the war is due in part to its “immediacy.” Hubbell’s own grandfather was a Confederate soldier — John Thomas Roselle, who served in a Missouri cavalry unit and spent time in a prison in Andersonville, Georgia. Only one came home without time spent in a hospital for treatment of a wound or disease. One of the soldiers came home and died within 10 months, his death probably hastened by post-traumatic stress.

Another Portage County soldier, not one of the seven framed in the film, was badly burned and had both arms blown off when he was leading an artillery duel. He died at a field hospital, but his commander wrote a poignant letter to his family back home in Randolph. The “Civil War was personal,” Enders said. “Soldiers went to war in a company full of their neighbors. Everybody they knew at home saw or heard.

While military history of the war is never far from his mind, Keefer is delving into the research territory he is “drawn now by the more nuanced questions — why this war is still fascinating.”

Kevin Adams finds that the papers submitted to Civil War History cover a variety of new areas, such as the environmental history of the war — how landscapes were affected and how they affected battle outcomes. The disease environment that cut down regiments, sometimes even before they fought, is being examined. So are gender issues — concepts of masculinity and masculinity in the face of battle, and the role of women. There is new interest in the West, such as debates in Union Square in San Francisco over whether California should be a free or a slave state.
Hubbell participated regularly in a Civil War roundtable, popular in many communities, at the Peninsula Library, where participants hear speakers and discuss the war. The current acquiring editor for history at the Kent State University Press, Joyce Harrison, has 15 years of experience here and in Kentucky and Tennessee acquiring Civil War books for academic presses. “I think people are just fascinated with a war that could divide people,” she said. The “what if” factor also keeps people wondering, what would have happened if the South had won the war?

Lincoln’s impact on the war and through his death left a deep imprint on our national psyche, according to Leonne Hudson, who is writing a book about how blacks responded to Lincoln’s death. “None were more deeply hurt or grieved more deeply” than black Americans, he said. After Lincoln was assassinated, it was not uncommon to find Lincoln’s photo next to an image of Jesus on their fireplace mantels. “He was their Moses,” he said.

The Civil War “touched all sorts of buttons,” including issues that we still deal with – PTSD, the southern-northern political divide, controversy over displaying the Confederate flag, the role of the federal government. “There is a chain that should continue,” says 1st Sgt. Jeff Smith, center, of the 8th Ohio Volunteer re-enactors. Smith, of Berea, with Cpl. Bradley Keefer, left, and Capt. Rick Betley of Northfield Center, bring alive for current generations the stories of Ohio’s Civil War soldiers.
Margaret P. Calkins is an architectural researcher with a passion for creating buildings that are comfortable for people in all states of health. She is particularly attuned to the needs of older adults, whose sight or balance may be poor or who may live with dementia. When her own parents were designing a retirement home in the 1970s, she bailed at the contemporary, all-window kitchen planned by her mother, who had severe glaucoma.

“She wasn’t able to see the edges of stairs, chairs and countertops and how they helped the elderly see and be sure-footed is part of her job. Calkins, Ph.D., who has consulted for many healthcare institutions and researchers with a passion for creating buildings that are so helpful but don’t make it look like you’re handicapped” is part of the process of design for this age group, said Calkins, who earned her undergraduate degree at Kenyon College in psychology.

At Kenyon, a course in the psychology of aesthetics first piqued her interest in designing environments. She took courses at Harvard’s Graduate School of Design and got advice from her older brother, who was an architect when she was in high school. She started to specialize in the impact of designs on people rather than design buildings. She convinced her father that he would have more credibility with architects if they had to push the curtain aside,” she said. That research, funded by the National Institute for Aging (NIA), is still cited, she added.

She learned that the NIA was looking to fund more studies with businesses, so while she continued her Ph.D., she also incorporated a business and began consulting for healthcare communities. She has had $6 million in research, funded by the National Institute for Aging (NIA), is still cited, she added.

After writing a thesis on building design guidelines for the aging, she went to work for Healthall, a nursing home in Chardon, Ohio, where a prototype memory-care assisted living building was being planned that relied on research-based guidelines. The Dolan Alzheimer Care Center (now in existence there) featured cues at every room entrance, so the resident living with dementia could find their rooms by recognizing their own mementos at the door.

The research bore this out: Residents were eight times more likely to use the bathrooms when the curtains were open and the toilet was visible. And they couldn’t figure out how to find the bathroom if they had to push the curtain aside,” she said. That research, funded by the National Institute for Aging (NIA), is still cited, she added.

In this area. “There is the potential for making this a real healthcare research arena,” she said.

for people of all ages. Zero-entry thresholds provide easier access for baby strollers as well as wheelchairs, she noted. Having a shelf next to the entry door provides a place to set down groceries while you find your key. Handheld shower wands can be used to wash children and pets as well as being easier for the elderly to handle.

Some healthcare design features can be expensive initially but offer long-term savings, she noted. Private hospital rooms significantly reduce the risk of infections. Ceiling-mounted patient lift mechanisms reduce injuries to healthcare workers and worker compensation claims. Healthcare workers are second only to construction workers in musculoskeletal injuries.

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Growing up and going to college in small-town southwestern Pennsylvania, I wasn’t sure where I wanted to be. I didn’t want to be able to speak the language. It had to be different. I wanted to be culturally uncomfortable. I wanted to be a minority.

My parents always told me that I needed to aim high and dream big. Because they gave me the ability to imagine, I took a chance and enrolled for graduate studies at the American University in Cairo. I was less enthused. Chasing tenure was serious and over-familiar with it and its inhabitants. By December 2010, I remember being so bored with Egypt that rather than go to Cairo for parliamentary elections, I stayed away, I was only a two-hour ride from where I grew up.

The initial 18 days of the 2011 Egyptian uprising were electric. Because of the seven-hour time difference and my teaching obligations, I just stopped sleeping. I was addicted to news. I got a Twitter feed for the latest information. I was invited to meet with senior members of the National Security Council at the White House. I was interviewed by National Public Radio. I was approached by the New York Times to write about the protests against the Mubarak regime. I was asked why the Muslim Brothers weren’t going to join the January 25th protests. I could barely contain my sarcasm. "Why?" I asked. "What good would it do for their organization?" The demonstrations would go nowhere and all it will do is lead to more arrests for the Muslim Brothers like the Brotherhood members I talked with a Coptic cross, a copy of the Koran held aloft and an Egyptian National Museum in Tahrir Square. A military officer wearing a gas mask and holding a weapon stands guard at the National Security Council at the White House as "grim reaper" is drawn on a Tahrir Square wall. A sign supported by the Wafd Party, below right, reads "United Egyptians" in Arabic in Cairo.

The spring 2011 term began. While snow fell outside my office window in Kent, my phone rang. It was Joshua Stacher, Ph.D., took photos of Egypt's upheaval on his state university's campus in 2011, left, in a file associated with his work in Egypt, right. Egyptian Army officers guard the Egyptian National Museum in Tahrir Square. A military officer and a journalist. She asked me why the Muslim Brothers weren't going to join the January 25th protests. I could barely contain my sarcasm. "Why?" I asked. "What good would it do for their organization?" The demonstrations would go nowhere and all it will do is lead to more arrests for the Muslim Brothers like the Brotherhood members I talked with a Coptic cross, a copy of the Koran held aloft and an Egyptian National Museum in Tahrir Square.

The years passed and before I knew it, I had access to members of Hosni Mubarak's ruling party, interview scores of leaders in the Muslim Brotherhood and drink beers with leftists, socialists and communists of all stripes. After a while, I blended in just as well and exchanges were loud. There was dirt, dust and sand everywhere. Cairo, a city that no one knows how many people inhabit, was perfect. I started my epic journey in 2001 and had no idea where it would lead me.

I met people from all over the world. I studied Arabic when I wasn't preparing for seminars. Instead of going home for Christmases or Damascun and Damascus and I was more often in Cairo or Damascus doing research comparing authoritarian regimes than in the quaint Scottish town. I finished my PhD at the University of St. Andrews in Scotland, I was more often in Cairo than go to Cairo for parliamentary elections, I stayed away, I was only a two-hour ride from where I grew up.

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I met people from all over the world. I studied Arabic when I wasn't preparing for seminars. Instead of going home for Christmases or Damascus and Damascus and I was more often in Cairo than go to Cairo for parliamentary elections, I stayed away, I was only a two-hour ride from where I grew up. My parents always told me that I needed to aim high and dream big. Because they gave me the ability to imagine, I took a chance and enrolled for graduate studies at the American University in Cairo. I was less enthused. Chasing tenure was serious and over-familiar with it and its inhabitants. By December 2010, I remember being so bored with Egypt that rather than go to Cairo for parliamentary elections, I stayed away, I was only a two-hour ride from where I grew up.

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Center in Atlanta. I published bold arguments that lots of my friends didn’t like. It was the most exciting period of my academic life.

I used spring break 2011 to go to Cairo. There I ran into friends from US, European and Australian universities. The debates that emerged and the discussions were infectious. I had never learned so much as quickly as I did, watching Egyptians push against their elites, regional powers and international forces who were clamoring for a return to the predictable days of Mubarak’s autocratic system.

At various points along Egypt’s turbulent transition after Mubarak, the direction of change passed intersections that could have produced different and more progressive outcomes. The Egyptian military escalated state violence against Egyptians. I spoke out against the trend. The U.S. government did little, if anything, to stop the violence. I spoke out against this to show the connective points of transnational flows of power, capital and coercion. One of my frequent interviewees in Cairo, Mohamed Morsi of the Muslim Brotherhood, who was elected president in 2012 in the first free presidential election in Egypt’s modern history. When given the opportunity to side with the street protestors and change the state and continuity, Morsi chose the latter. I raised against Morsi and his autocratic tendencies. When commentators blamed the protesters for “not having a plan” or being disorganized, I countered that governments and elites carry far more influence than populations in how a political situation emerges. At no time in my professional life have I been as awake as when I arrived in Cairo. I participated in a movement that is meaningful, when academic agendas that seek to understand and explain the globalizing world in order to prepare our students for life, the Arab uprisings facilitated and enhanced this dynamic.

I have come to respect the process of research as life transforming. Just like the 22-year-old kid that I was in 1998, showing up in Cairo to gain some overseas experience, I continue to learn about life and politics from Egypt and the Arab world.

The most important lesson that I have learned is that there are not clear or easy boundaries between life and research. I discovered that not all that should be learned is book-based, and research designs have limits. Learning from experience and experiences is the single greatest way to develop nuanced understandings of the complex social world, clear opinions about the best types of political systems to help achieve social justice and how best to transform my interactions with students, colleagues and friends into cauldrons of critical thinking. This is what inspires me. I hope it inspires others to find their Cairo, which is, after all, just one of countless destinations of scholarly pursuit. Wherever your research agenda takes you, committing to the people and the place you study makes all the difference.
There was a time in England when it was
widespread for students to travel, if you
were to gain entry to the highest social class.
That English ultimately prevailed as the
language of a country conquered in 1066 by
the Normans is remarkable, said Sonia Fein, Ph.D.,
whose scholarship has centered on the first
great poet to write his most important work in English,
Geoffrey Chaucer. She is the editor of
“The Chaucer Review” and a former trustee of
the New Chaucer Society.

Last summer Fein, professor of
English, taught 16 master high school English teachers in
a month-long National Endowment for the Humanities
seminar designed to immerse them in
Chaucer’s poetry and his world. The group traveled from Southwark in London to Canterbury
Cathedral, a 60-mile journey tracing the pilgrimage to the site of
Thomas Becket’s martyrdom
that Chaucer immortalized in “The Canterbury Tales.” The goal was to offer the teachers new
insights into tales that still resonate, more than 600 years after Chaucer wrote them.

Fein asks. The Pardoner tells a dark tale about
“Questions about ethics, belief
and desire come
up, character by character,” she added, with the tavern
keeper-host chiming in as a sort of
literary critic.

"He's seeing that the world is refracted by the way
people talk," she said. "In Chaucer, he's seeing it in a way that
human beings have been seeing it, at least in Western cultures,
in the last several hundred years or longer.

But what scholars have often neglected since the 1930s
is that Chaucer's world was one not just of courtly
love but of economic justice and
poetry that still resonates, 600 years
later. It's remarkable that he creates a new persona for each story.

"It's remarkable that he creates a new persona for each story."

As the 30 characters of
Chaucer’s pilgrimage
make their way from the Tabard Inn, a public house
in Southwark on the south bank of the Thames in London, to Canterbury
Cathedral, their tales unfold as a way to entertain themselves and compete for a free
meal back at the inn when they return. The Knight, the Miller, the Reeve, the Cook, the Wife of
Bath and more
show their wits and make their way from the Tabard Inn, a public house
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Cathedral, their tales unfold as a way to entertain themselves and compete for a free
meal back at the inn when they return. The Knight, the Miller, the Reeve, the Cook, the Wife of
Bath and more
show their wits and strive to outdo each other in storytelling skill. Not all of
the promised tales are told, however; Chaucer died in 1400 before finishing the work,
and it is up to his executors who compiled it, Fein said.

In her book, "The Harley Lyrics," a
legal scholar, is known to have copied the two oldest
manuscripts known for its gathering of
the early English poems, “The Harley Lyrics.” This manuscript,
now in the British Library, London, is the
beautifully illuminated Ellesmere manuscript, on view at
the Huntington Library in San Marino, California.

The tale that she told to his dark tale about
good and drudgery, plague and murder. “It is a
beautiful character or at least it’s somewhat mysterious,” she said. Some of
the pilgrims are optimistic, others cynical. Most are
somewhere in between.

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John West, Ph.D., has always felt comfortable in environments with contrasting cultures — industry and academia. “He’s able to bridge the chasm between basic science and making a product to sell for his new startup company, ITOS.”

The key to his new venture is an invention born in his laboratory at Kent State — an electrically conductive material that can be embedded in flexible transparent films and used in electronic devices. The invention exploits a disadvantage with indium tin oxide (ITO), which conducts electricity and is used in transparent thin-film cells, computer screens, and liquid crystal displays. ITOS is electrically conductive and crack resistant. West’s innovation is to controllably crack ITO coatings by bending flexible displays. ITO is brittle and it cracks. West’s innovation exploits a disadvantage with indium tin oxide (ITO), which conducts electricity and is used in transparent thin-film cells and liquid crystal displays. ITOS is electrically conductive and making a product to sell will be tested with his new startup company, ITOS.

West hired his Ph.D., who last year was a postdoc at LCI after earning his Ph.D. in chemical physics at Kent State. “Our work is to controllably crack ITO coatings by bending flexible displays. ITO is brittle and it cracks. West’s innovation exploits a disadvantage with indium tin oxide (ITO), which conducts electricity and is used in transparent thin-film cells and liquid crystal displays. ITOS is electrically conductive and making a product to sell will be tested with his new startup company, ITOS.”

He has been surprised, though, at how well some of his classmates and all the people you have to be involved with.”

West has also plans to be an industrial partner with Kent State, which will allow him to use the university’s machine shop. When he first came to Kent State from Digital Recording Corp. in Salt Lake City, where he was director of media development, West created LCI’s industrial partners program, attracting companies such as General Motors and 3M, which licensed it for use in applications such as windows for sunroofs. West’s new technology for windows will be less expensive, though the technology could be applied to other products, too, such as smartphones. FITOS is producing substrate films with the flexible electronic technology embedded in them and will sell them to window manufacturers who will install them in their factories. West expects to make 2,300 to 3,000 substrates initially. He’s also working on new prototypes with FITOS researcher director Nick Doris, Ph.D., who last year was a postdoc at LCI after earning his Ph.D. in physical chemistry at Kent State. Doris joined at the chance to find a job locally and to work for a startup, even though many of his classmates went to work for large, established companies such as Apple, a major hire at LCI. As West said, “If you want to learn the ropes of doing everything, come to a startup.”

Doris has been excited about learning marketing: “I was a student at Kent State when West joined, and he has been surprised at how well some of his classmates and all the people you have to be involved with.”

A researcher goes to market

John West with four versions of the electronic “venetian blind” effect that FITOS technology adds to windows. Left, a Scanning Electron Microscope image, next the prototype and then the actual technology. The result is FITOS — flexible ITO solutions.
Using advanced imaging techniques and sophisticated software analysis, researcher Rob Clements, Ph.D., can generate 3D models and very high resolution images of body tissues, organs and cells. These can be used to pinpoint the effects of disease and track changes over time, information that can be used in developing treatments.

Robert J. Clements, Ph.D., wants to see inside your head. And not just at the level a doctor can see inside your brain now with magnetic resonance imaging (MRI). He is developing new imaging techniques that can look at what’s going on in the brain down to the level of a single cell. He can reconstruct in 3-D a model of exactly where a neurodegenerative disease such as multiple sclerosis (MS) is causing lesions and then track changes over time, a tool that will someday be useful for assessing how a disease is progressing and how it responds to treatment.

The new technologies he works with make it possible to see complex internal organs or systems in three dimensions or even 4-D — three dimensions over a time sequence. This can help researchers and clinicians to locate and visualize the area they are interested in and gain new insights.

The images also have proven to be provocative teaching tools. In two studies, Clements and Kent State education experts introduced the technology into local high schools so that science students could see, for example, visualize the structure of DNA. In classes where the imaging technology was used, test scores improved. Students were engaged and excited, Clements said. He is also investigating the use of touch or tactile feedback devices to help visually impaired students understand spatial concepts. He is using electroencephalography (EEG) brain activity recordings to learn more about the mechanisms involved in 3-D image viewing and memory formation.

Clements has even explored extending the 3-D system to fashion, architecture and art applications, experimenting with it in Florence, Italy, at Kent State’s study-abroad site, to help visualize ancient artifacts and statues such as Michelangelo’s “David.”

Some of the finely detailed, high-resolution microscopic imagery he has developed is more suited to research at the cellular level than for clinical use. But by modifying MRI protocols he also has been able to acquire greater contrast and definition than would be possible with conventional MRI imaging. This only requires a change in software routines and could be deployed in existing scanning systems, he said, possibly eliminating the need to achieve contrast with dyes, which can harm kidneys or provoke allergic reactions in patients.

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His techniques combine MRI with laser-scanning confocal microscopy of tissue sections and software analysis techniques, greatly increasing resolution and pinpointing what is seen more broadly through magnetic resonance. A reconstruction can then be projected stereoscopically for a three-dimensional view. With algorithms that Clements developed in collaboration with computer scientists, the multi-channel, high-resolution datasets are automatically analyzed to quantify and classify cells, among other things. By using clusters of computers, data can be delivered faster and can be more accurately reproduced. The 3-D images are not just visual aid but incorporate a wealth of information about disease state, body function and the effects of treatment.

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Long before emails, text messages and tweets became preferred for personal communication, handwritten letters carried news, gossip and intimate details of life from one person to another. Letters, like their electronic counterparts, were sometimes indiscreet. They conveyed anger, exasperation, humor, observations about life and family history. Unlike their 140-character successors, they could range for pages, but like them, they might be sent — and delivered by the postal service — more than once a day.

Long minutes written in a cursive hand with little or no punctuation form a 170-letter collection from the mother of poet Walt Whitman to her son. Edited, annotated and prepared for the 21st century’s digital formats by Wesley Raabe, Ph.D., associate professor of English, they are now available to scholars and the public on a website, “walter dear,” that is part of the electronic Walt Whitman Archive.

The letters of Louisa Van Nevel Whitman offer insight on the great American poet and the woman whose perspective influenced his work. “Leaves of Grass” is the flower of her temperament active in me,” Walt described it. She often used phonetic spelling. An occasional closed parenthesis “formal” sense, as Walt described it. She read almanacs and fiction, such as George Sand’s novels. She was illiterate in a stylistic sense — a “sensual” sense, as Walt described it. She conveyed anger, exasperation, humor, observations about life and family history. Unlike their 140-character successors, they could range for pages, but like them, they might be sent — and delivered by the postal service — more than once a day.

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E-cigarettes, largely unregulated now, can be used to vaporize and inhale liquid nicotine with various flavors, but they also can be filled with a host of other products, from THC, the active ingredient in marijuana, to Cialis. Sold over the Internet, unbranded, cheaper varieties carry no assurance of quality or content control. “What are you smoking?” is a real, not ironic, concern.

But even the popularity of e-juice appears to be rising. Little research has been done on how college students, the prime customers, view them.

A 2009 survey of college students, done elsewhere in the Midwest, found that 4.9 percent had ever used e-cigs. In Kenne’s survey, completed by more than 9,000 Kent State students, 22 percent said they would try an e-cig if a friend offered it. The flavors most favored by respondents were fruit, followed by menthol and tobacco.

In Kenne’s survey, 27 percent said they would try a flavored e-cigarette if it were offered by one of their best friends, and 16.5 percent would try a non-flavored variety if a friend offered it. Flavors most favored by respondents were fruit, followed by menthol and tobacco.

Other findings indicated a fair degree of tolerance toward the use of e-cigarettes on campus. Currently there are no regulations, other than rules that faculty or administrators may establish about not vaping in class or public spaces (e.g., library, student center). Kenne hopes to continue the survey over the next several years to assess change in use over time. Meanwhile, the jury is still out on whether e-cigarettes are a gateway to future nicotine addiction.

So are e-cigarettes a useful tool in helping people quit smoking? The jury is still out on whether e-cigarettes are useful in reducing the use of real cigarettes or whether they are a gateway to future nicotine addiction.

Kenne’s survey, completed by more than 9,000 students, showed that those who have tried e-cigarettes did so primarily to experiment with the product more than to quit smoking or find a healthier alternative. Nearly 28 percent had used an e-juice at least once, and an additional 7.7 percent said they were very or somewhat likely to try them in the future. Current smokers of regular cigarettes were most likely to have tried e-cigarettes, followed by former smokers and those who had never smoked.

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Research scientists often have to customize equipment and create laboratories tailored to their needs. With the help of the university’s machine shops, technicians and their own research teams of postdoctoral associates and students, they develop the specialized tools required for their experiments.

Knowing what you need and figuring out how to modify equipment is part of the nature of research, said Hamza Balci, Ph.D., assistant professor of physics, whose laboratory provides a prime example of custom design.

Balci looks at single DNA molecules and single proteins. He studies how the ends of chromosomes are protected against RPA, a protein specialized in detecting DNA damage in the form of single-stranded DNA. DNA in the cell is in a double-stranded form and is separated into two strands when the DNA is copied (replication) or when one of the strands is damaged and needs to be repaired. In both cases RPA binds to the single strands and stops the cell cycle until the replication or repair is done.

An exception to this system is the chromosome ends (telomeres), which naturally have a single-stranded overhang. Telomeric overhangs buffer the ends of chromosomes and allow cells to divide without losing genes. Binding of RPA to the overhang needs to be prevented to avoid a false signal and the disruption of the cell cycle. The single-stranded overhang forms unusually stable structures called G-quadruplex that help block RPA from their site, protecting their own critical function. How they do this is the focus of Balci’s study.

To do it he needs a microscopic imaging system that can image single DNA molecules and collect as much light as possible. The system requires a laser to penetrate only 100 nanometers from the surface – not through the entire sample – in order to reduce background noise. The setup is built part-by-part around an Olympus IX71 microscope. His research team has assembled lenses, mirrors, filters, dichroics and prisms in a configuration that guides the laser’s entry and exit path. An Andor Ixon EMCCD camera with single photon sensitivity is used to detect tiny signals.

The parts and the instruments are expensive and often can perform only one function where Balci needs several. The laser alone costs $15,000 new, although he found one for $2,000 on eBay. “I use a lot of eBay parts,” he said. Industrial companies that go out of business often sell their instruments there.

Like other researchers, Balci used start-up funds from the university to help pay for the laboratory setup. He also received a Burton Family Innovation Award for Young Investigators, a College of Arts and Sciences Research Resources award and a grant from the National Institutes of Health.

Essential to the lab were the services of the physics department’s technical shops, providing tools that could not be obtained commercially. Wade Aldhizer, research machinist specialist, built adapters for the microscope, including one that needed to be at a precise 11-degree angle. Alan R. Baldwin, Ph.D., research engineer in the electronics shop, made a customized controller box for the laser.

Balci, an experimental physicist who has been at Kent State for five years, earned his Ph.D. at the University of Maryland in the field of superconductors. He learned optics and biophysics as a postdoctoral fellow at the University of Illinois, where he had to build his own instrument systems to analyze data. He collaborates with biochemists at Kent State and sends his own graduate students to train with other research collaborators at the University of North Carolina, the University of California at Berkeley and the University of Illinois. Part of what they bring back is the ability to customize his lab for their own research projects.

“You can modify it,” he says of the lab. “It’s an open-frame structure.”
In symposia presentations and collaborations on campus, researchers at Kent State University tell their stories and share their research.

At the Neuroscience of Obesity symposium (photo grouping near right, top), keynote speaker Michael Rosenbaum, professor at Columbia University Medical Center, is shown (top right) in a panel with Antonio Convit, professor at New York University School of Medicine, and Rajita Sinha, professor at Yale University. The North American Organic Electric Association working group (right, bottom) gathered at Kent for a meeting hosted by Kent State. Opposite page: At the first Symposium on Aging (left side, top photo), Gregory Smith, Ph.D., welcomed speakers Laurence Rubenstein, professor at the University of Oklahoma College of Medicine and Judy Stevens, epidemiologist with the Centers for Disease Control and Prevention. Kent State President Beverly Warren (left, middle photo) met with speaker Bonnie Burman, director of the Ohio Department of Aging. Center photo: 2014 Outstanding Researcher and Scholar awardees Marcia Zeng, James Tyner and Quan Li were presented by Gerassimos Petratos, Ph.D., above them, right. Li (top right) accepts his award. Center bottom photo, visitors from Rikkyo University in Japan try out an energy-saving Elf driven to work by Paulette Washko, director of research compliance. At the second annual Symposium on Water (bottom right photo group) keynote speaker David Sedlik, professor at the University of California, Berkeley (second from left, top photo) talks with Kent State researchers. Bottom right, lecture by Kent State faculty member David Costello.
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At the Neuroscience of Obesity symposium (photo grouping near right, top), keynote speaker Michael Rosenbaum, professor at Columbia University Medical Center, is shown (top right) in a panel with Antonio Convit, professor at New York University, Beryl Marks, and Rajita Sinha, professor at Yale University. The North American Organic Electric Association working group (right, bottom) gathered at Kent for a meeting hosted by Kent State. Opposite page: At the first Symposium on Aging (left side, top), Gregory Smith, Ph.D., endowed speaker, Lawrence Maloney, professor at the University of Oklahoma College of Medicine and Judy Blevins, epidemiologist with the Centers for Disease Control and Prevention, met with speaker Bonnie Burman, director of the Ohio Department of Aging. Center photo: 2014 Outstanding Researcher and Scholar awardees Marcia Zeng, James Tyner and Quan Li were presented by Gerassimos Petratos, Ph.D., above them right. (Top right) accepts his award. Center bottom photo, visitors from Rikkyo University in Japan try out an energy-saving Elf driven to work by Paulette Washko, director of research compliance. At the second annual Symposium on Water (bottom right) phosphorus keynote speaker David Mohler, professor at the University of California, Berkeley (second from left), top, talks with Kent State researchers. Bottom right, lecture by Kent State faculty member David Costello.