

From the Vice Chancellor

I am delighted to bring to you this edition of the LSU research magazine in my capacity as the new Vice Chancellor of Research & Economic Development. I am excited about the research activities of our faculty, staff and students that bring recognition and enrich our research profile.

LSU is a land-grant, sea-grant and space-grant institution and as such it has the obligation to serve all interests of Louisiana and the nation. In spite of repeated budget shortfalls and several natural and man-made disasters that have impacted us over the last several years, I am proud to see how well our faculty and students have held up the traditions of research that flourish here at LSU. In these pages you will read examples of our groundbreaking research and creative endeavors that make LSU a vibrant place to work.

As most research universities do, we have also identified several broad thematic areas that will be the focus of our efforts in the years to come. We will be providing support toward the development of large center type proposals in these areas and seek to involve the entire LSU research active faculty. We will also be investing in and helping young faculty develop their research programs to establish their career here at LSU. Several new and exciting infrastructure supports for facilities improvements are also ongoing at LSU.

I hope that you will enjoy reading these stories and articles about our research and visit our new and improved website (research.lsu.edu) for more details.



Kalliat T. Valsaraj

Vice Chancellor, Research & Economic Development
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Ike East Professorship in Chemical Engineering*



LSU RESEARCH

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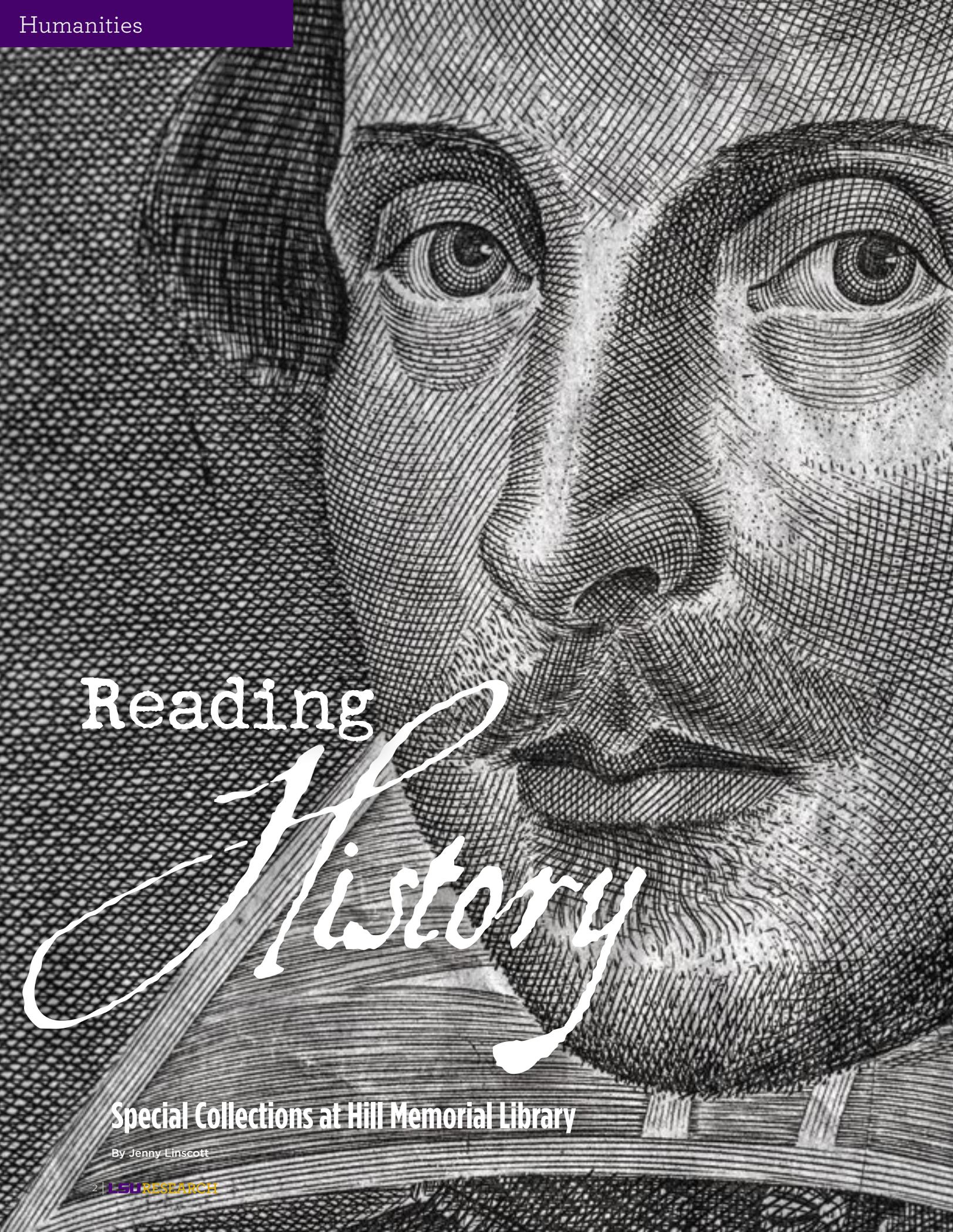
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Reading
History

Special Collections at Hill Memorial Library

By Jenny Linscott



t first glance, the *Book of Hours* held in the LSU Library Special Collections looks deceptively ordinary. It's small, roughly the size of a paperback novel and bound in a plain white cover. Inside, it's a treasure - an illuminated manuscript from the 15th century, written in a medieval handwriting style called Gothic book hand and decorated with delicate vine tendrils, full-page illustrations and incandescent shades of blue, red and gold.

This *Book of Hours* is part of the Rare Books Collection, one of five major collections housed in the LSU Library Special Collections division, located in Hill Memorial Library. Special Collections provides rare, valuable and original resources for research in a wide range of disciplines, particularly in the humanities.

For humanities scholars, a centuries-old resource like the *Book of Hours* opens up countless possibilities for research.

"A book of hours is a prescribed set of prayers which were said throughout the day," said Tara Laver, interim head of special collections and curator of manuscripts at Hill Memorial Library. As production and readership shifted away from the church, they became more popular and more accessible.

"I've seen them referred to as the best-sellers of their day. They were made not for people of the church, not monks or nuns, but for the laity." Today, books of hours are windows into not only medieval religious practice, but medieval secular life as well.

Laver explained that, because each book of hours is unique, the particular content of this manuscript can offer clues to its history. "Different forms and conventions were used in certain areas," said Laver. A graduate thesis in 2005 concluded that this copy was likely produced for the Paris market by a team of at least seven different scribes and illuminators. Faint red guide lines used by a scribe to align his text and barely visible on the page, offer insight into how these artisans worked.

Embellishments offer material for other kinds of explorations in the humanities. Illustrated scenes from the Bible invite research into medieval garments, religious art, or even readership. "Most books of hours were commissioned for women, so they were often given as wedding gifts," said Laver.

Also housed in the Rare Book Collection is Shakespeare's *Second Folio*. Printed in 1632, the *Second Folio* has long been at the heart of Shakespeare scholarship.

Today, humanities scholars studying Shakespeare have easy access to his plays in hundreds of different print and digital formats. But reading *The Tempest* on a tablet screen in a dorm room, and sitting at a table with a copy that is nearly contemporaneous with the Bard himself, are two different experiences.

The *Second Folio* held in LSU's Special Collections is an artifact in its own right. It contains a dedicatory poem by poet John Milton, his first in print. A colophon at the end of the volume identifies the individuals responsible for publishing it. "Plus, someone might study the paper, the typography, the variations from page to page, the marginalia, or clues to its provenance," said Laver.

When you picture a world-class research institution, what are the first things that come to mind? For most of us, it's science-based imagery: lasers, labs, test tubes and technology. In other words, the tools and centers that support scientific research. But it's not so often that we think of other forms of support for research and scholarship outside the sciences. LSU's legacy of writing, historical excellence in music and dedication to the arts didn't just spring up out of nowhere. The university is filled with a reservoir of hidden treasures ready to supplement our humanities and performing arts scholars in their hunt for the history behind their work.

In the pages that follow, you'll learn about the depth and power of LSU's Hill Memorial Library, which houses our special collections and more than a few treasures, but that's only the beginning of the resources found across campus.

Other examples include LSU Press, which contributes to LSU's academic prominence through scholarly inquiry and ensures a significant contribution to the world of scholarly endeavor. Founded in 1935, it is one of the oldest and largest university presses in the South, and is the only regularly publishing university press in Louisiana. LSU Press is also home to the *Southern Review*, the preeminent literary journal of the southern United States.

Swine Palace is a non-profit, professional theater company situated on LSU's campus that supports the educational mission of the Department of Theatre by serving as a training ground for students in Louisiana State University's M.F.A. Professional Actor and Technical/Design Training Programs. The plays produced there are professional productions of classical and contemporary theater with an emphasis on plays exploring issues of social equity.

Have questions about LSU's resources for the humanities and performing arts? Send an email to researchnews@lsu.edu.



One of the LSU Special Collection's most treasured items is its illuminated *Book of Hours* from the 15th century.

Ghostly wisps of handwriting on the front and back covers suggest that this volume was once owned by the Earl of Newport, an Irish peer in the 17th century. Much like the red guide lines in the *Book of Hours*, these are immediate, tactile links to history that can never quite be reproduced on a computer screen.

Special Collections also includes the Louisiana and Lower Mississippi River Valley Collection, or LLMVC, the largest and most prestigious collection of historical documents and records related to this region. With millions of holdings, including handwritten letters, survey maps, historic photographs, oral histories and even the personal journal of the first governor of Louisiana, William C. Claiborne, it offers unprecedented research opportunities in the history and culture of Louisiana.

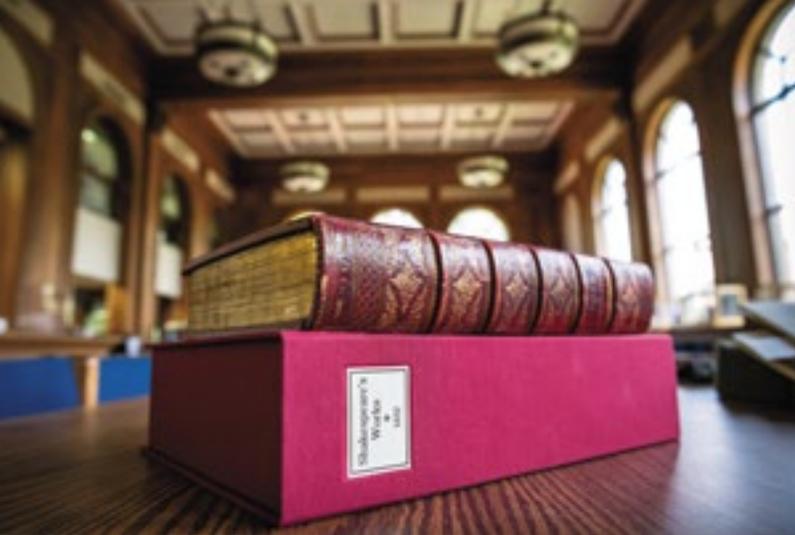
Laver sees students in history, English, anthropology and historic preservation visiting this collection often. "When I was a student here in the history program, I liked reading the documents and being with the documents for themselves," she said. "There's something amazing to me about them. When you've got letters and diaries from people, they're such an intimate thing."

Special Collections also includes collections on popular culture. The Bowlus Collection of Comic Books contains classic issues from the Silver Age of comic books, while the Laughlin Collection showcases works of science fiction and the occult. These texts can show a society reflecting on and refracting itself as it grapples with contemporary problems.

Special Collections is available for undergraduate and graduate students at LSU, as well as independent researchers and the general public. Researchers visit from local communities in Louisiana and around the world.

"So much of the value of our collection is based in the sum of its parts," said Laver. "We have a body of materials available for research. We like to give individual holdings attention, but we are mindful that we're not a museum. They are artifacts, in a way, but our intent is to support research."





Another highlight of LSU's Rare Book Collection in Hill Memorial Library is Shakespeare's *Second Folio*, printed in 1632.



LSU Libraries isn't just known for its volumes of information in digital and tangible forms. It also stands as a key hub for research information by the U.S. Army Corps of Engineers.

Since 1907, LSU Libraries has been a participant in the **Federal Depository Library Program**, a program that partners libraries with the U.S. Government Printing Office in order to provide access to government publications, free of charge, to the public. Even before becoming a depository, LSU Libraries acquired federal documents dating as far back as the late 1700s. Then in the mid 1960s, the libraries became a Regional Depository Library location, a designation that requires LSU to collect, maintain and make available in perpetuity every federal government publication sent to the libraries through the collaborative program.

Thus, LSU Libraries has a well-maintained collection of almost 4 million federal titles in several kinds of formats—particularly print. While digital is quickly taking over as the format of choice for newly published materials, the bulk of historical print materials is still not available digitally. For this reason, LSU Libraries opted to do its part in the nationwide effort to digitize these older titles.



“Our local effort was prompted by the creation of the Collaborative Federal Depositories Program of the Association of Southeastern Research Libraries,” said Elaine Smyth, interim dean of LSU Libraries. “In early 2011, LSU signed an agreement to become what is known as a Center of Excellence, or COE, in this program, the purpose of which is to provide our geographic region with access to those historic and often rare materials published by the federal government. An important aspect of the program is to match each member library with one or more discrete collections of materials published by specific agencies, departments or bureaus of the federal government. An attempt is made to match on the basis of local needs and interests.”

It is from this awareness of special needs and interests pertaining to the waterways and coastal environments of southern Louisiana that LSU Libraries elected in 2011 to become a Center of Excellence for the United States Army Corps of Engineers' materials.

Throughout 2012, Smyth said, LSU Libraries' Government Documents Department participated in the Association of Southeastern Research Libraries' Disposition Database, enabling the libraries to request from other southeastern libraries publications falling under USACOE ranges.

“Through that process, we were able to add approximately 130 volumes to our COE collection,” she said. “We also began a process of digitizing specific COE titles relating to Mississippi Valley Waterways in order to contribute to the Board of Regents' grant-funded digital library of Mississippi Valley Waterways materials. By the end of the year, we had identified 30 volumes of USACE materials that netted 7,045 pages when digitized. These materials included environmental statements; technical reports; feasibility studies; and project maps of rivers, harbors, bayous and other waterways of our geographic area.”

Deep underneath the Whillans Ice Stream in West Antarctica lies Lake Whillans, a dark and mysterious subglacial lake. The lake has never been breached by humans before – until now. Since the lake was first described in 2007¹, scientists have been interested in drilling down through the 800 meters of ice that separate the lake from the icy surface of Antarctica in order to investigate whether it harbors life.

On January 28, 2013, that objective was officially accomplished by a team of U.S. researchers funded by the National Science Foundation. Researchers participating in a project called the Whillans Ice Stream Subglacial Access Research Drilling program, or WISSARD, pulled water and sediment samples from Lake Whillans up through a narrow hole spanning 2,600 feet of ice, or roughly twice the height of the Empire State Building in New York City. LSU's Brent Christner, associate professor in the Department of Biological Sciences, and his students Peyton Adkins and Amanda Achberger, were among the scientists onsite preparing and executing the project.

“The scientists participating in WISSARD have a common interest in how water affects the properties of the ice stream and if it provides an environment for life underneath the West Antarctica ice,” Christner said. “The ice stream we drilled through to get to Lake Whillans is a major feed for the Ross Ice Shelf – a large floating raft of ice that is roughly the size of France or Spain.”

Starting in December 2012², WISSARD used 13 Case tractors - huge vehicles built to traverse the ice pulling sleds with payloads of hundreds of thousands of pounds - to pull laboratory and drilling equipment roughly 600 miles to the lake site from McMurdo Station, the main logistic hub for the United States Antarctic Program.

“We deployed team members in October to prepare for this project,” Christner said. “Amanda, Peyton and other project participants were there before Thanksgiving, setting up the labs and rounding up gear. All that preparation was necessary for a short window of borehole opportunity – a time when the borehole was open and we could access the lake – that amounted to only four days.”

The logistics of the project were daunting in and of themselves. With set-up beginning in October, Christner's team had to work tirelessly to prepare and execute the project, which consisted of a narrow window of opportunity to sample water from the lake deep under the Antarctica ice sheet, before the Antarctic winter, which occurs during spring and summer in the northern hemisphere.

“There was a set date at which we had to stop science operations,” Christner said. “If weather or mechanical

failures had pushed our timeline even a few days forward, we wouldn't have been able to accomplish what we did. For example, another group of scientists from the UK who were attempting to execute a similar project this year in another portion of West Antarctica actually had to stop during the drilling phase because they ran out of fuel. So these are not easy systems to work on – not only because they are in remote locations with harsh conditions, but because once you actually get there, you must penetrate nearly a kilometer of ice to do science.”

Despite major challenges, the WISSARD project was successful in obtaining water and sediment samples from Lake Whillans. Over the U.S. winter, Christner's team joined researchers from Montana State University, the University of Tennessee, the University of California Santa Cruz, the Scripps Institute of Oceanography, Northern Illinois University, Pennsylvania State University and several other collaborators in Antarctica. Collaboration has been a key component of the complex task of locating and drilling into Lake Whillans to retrieve water and sediment samples containing microbial life while minimizing the introduction of contamination from the surface.

“There isn't an 'X' over this lake,” Christner said. “So when you go there, it is not obvious that there is a lake beneath you. Two years before we even arrived onsite to drill, a collaborating geophysical team used radar and seismic data to constrain the lake boundaries and characteristics. This data was instrumental in deciding where to drill and to understand the lake dynamics, because Lake Whillans is connected hydrologically to other bodies of water beneath the ice sheet.”

Collaborating geophysical teams have shown that Lake Whillans has a fill and flood cycle, and that it is ultimately connected to the ocean underneath the Ross Ice Sheet. They were able to locate the subglacial lake by detecting wave patterns beneath the ice.



Antarctica's Deepest Secrets

By Paige Brown

“One of the things that we will pursue during the 2013-14 field season is going to the area where water that originates from the lake enters the marine environment, which will be under several hundred meters of ice,” Christner said.

Once the site of drilling had been located, Christner’s team and collaborators designed, constructed and tested an intricate system for accessing Lake Whillans through 800 meters of ice without contaminating the lake environment or samples with bacteria or chemicals from the surface. A major concern in the exploratory efforts of WISSARD is environmental protection of the pristine environment below the ice. To this end, the

WISSARD project took a different approach to drilling than the scientists who drilled into Lake Vostok in 2012, where Russian researchers maintained an open borehole for sampling using kerosene to prevent the water in the hole from freezing and to maintain an open borehole though nearly 4 km of ice. In contrast, the U.S. research team drilled into Lake Whillans using extremely clean, hot water to prevent contamination of the lake and samples retrieved.

“This project required years of preparation and months to execute, all for four days of intense sampling of the lake,” Christner said. “And all of this, I should mention, had never been done before. We essentially have one kilometer of large garden hose, being fed by a series of hot water boilers, injecting and drilling to create the borehole. Once drilling is done, the clock starts ticking, because the ice around the hole begins to freeze and close the hole. So we have a very limited window of sampling opportunity.”

Christner’s team and collaborators had to work quickly to retrieve water and sediment samples from the lake once the drilling phase of the project was complete. The goal of the project was to retrieve pristine water and sediment samples from the lake in order to test the hypothesis that the lake is an ecosystem for microbial life. Achberger, an LSU Ph.D. student on the project, is interested in the ecology of the lake system and the nature of life in the lake.

“We are interested in how microorganisms that may be present are using nutrients in the system,” Achberger





LSU's Brent Christner, along with his team of student researchers, worked with the national WISSARD group to drill through 800 meters of ice to access sub-glacial lakes in Antarctica to find metabolically-active microbes.

said. "These nutrients have been underneath the ice for hundreds of thousands of years potentially, so it is a really interesting system from that point of view. We are lucky in that we have many different individuals, interests and goals coming together to understand how this system might be functioning as an ecosystem."

As Christner and Achberger are interviewed about their work in the WISSARD project, water samples from Lake Whillans are being flown to their labs at LSU for analysis. On site, researchers could only gather preliminary data as they looked at lake samples under the microscope and conducted other crude measurements. However, Achberger explained, preliminary data were promising, showing what looked to be DNA-containing cells in the lake water.

"There absolutely were cells there," Christner said. "But microbes aren't like most other organisms that you can identify simply by looking at them. Many microbes look very much the same, even identical, under the microscope. So when we get the samples back, we will use DNA analysis to investigate and identify the genes of these organisms as a way to tell us what they are

related to, and what they might be doing metabolically in the environment."

Christner's team is interested in investigating whether this lake is truly an ecosystem, and if so, how the organisms in the ecosystem are making a living and where they are getting their energy from. By examining the contents of the lake's sediments, Christner's team could uncover ancient climate and biological records from a time when West Antarctica was ice-free and part of the ocean.

We are generating the data right now," Christner said. "We are working towards presenting our data in the form of a scholarly publication by the end of this year."

For more information on WISSARD, visit wissard.org/about.

For more information about how scientists drilled into Lake Whillans, watch a WISSARD video at: bit.ly/15DxFUj.

¹ <http://www.wissard.org/about/study-area>

² <http://sites01.lsu.edu/wp/lsuresearch/2012/10/31/journey-to-antarctica1/>



Louisiana's coastal crisis is no exaggeration. This state has 40 percent of the nation's wetlands but more than 80 percent of the nation's wetlands loss. We are losing this unique, immensely valuable resource at the rate of more than a football field every hour. Current estimates suggest that one out of every four homes within 500 feet of shoreline will be lost over the next 60 years.

The coast also acts as an important buffer in the face of hurricanes – every 2.7 miles of wetlands absorbs approximately one foot of storm surge. Also, much of the state's economy and culture is based off of its coastal assets: natural resources, seafood and, of course, people. It only makes sense that LSU, the state's Flagship University, play a leading role in research that helps officials better understand, preserve and manage these critical coastal ecosystems before they – quite literally – wash away.

LSU's history of excellence in coastal studies, paired with its current initiative to increase research and impact on this jewel of the Gulf, is targeted to protect the cultural assets that come with living in such an exceptional place while also protecting our natural resources and ensuring the future of this great state. Our history of coastal research excellence is unrivaled. LSU was designated the nation's 13th Sea Grant College in 1978 and currently holds the highest performance rating possible by the National Sea Grant Review Panel. It manages and/or participates in more than 50 research, extension, education and communication projects across the coastal landscape and serves as a bridge between academic expertise and the needs of those who manage, conserve, enjoy and make their living on Louisiana's coast. Our Coastal Studies Institute (see page 15) has a 60-plus year history of research that shaped the way scientists look at coastal processes today, and has produced some of the most internationally-recognizable names in the field. The Coastal Sustainability Studio is situated in the LSU College of Art & Design. The work done in the studio spans multiple disciplines, bringing together scientists, engineers and designers to intensively study and respond to issues of settlement, coastal restoration, flood protection and the economy, and implement real solutions where they matter most.

LSU has
450
CURRENT GRANTS
related to
**COASTAL
RESEARCH.**

There are
\$37 billion
in Projected LOSSES
to the **FISHING INDUSTRY**
by the year **2050**
as a result of
COASTAL LAND LOSS.



LOUISIANA
boasts more than
**4 MILLION
ACRES**
OF WETLANDS
which equals
40%
of the nation's total.



Campus-wide, more than 200 faculty members at LSU are currently involved in coastal-related research, engaging in everything from preventing erosion, keeping our fish and seafood safe and clean, documenting Louisiana culture in fading cities and helping our coastal business community remain strong and active – and everything in between. LSU has more than 450 coastal-related grants totaling \$73 million. What does that really mean? It means that these dollars have been provided by federal and state funding agencies, industry and sometimes even private citizens to support scientific research, engineering surveys and other such studies necessary to develop a better approach to preserving our coast and enhancing its productivity. It means university researchers entered into a competitive process with faculty from across the nation and won the right to conduct this work because of their high-level of expertise. And it means that researchers at Louisiana's flagship university are actively focused on one of the state's leading concerns, leading the way toward real solutions for a very real problem.

LSU's Office of Research & Economic Development literally wrote the book on responding to the Deepwater Horizon oil spill. University faculty were among the first to analyze the oil, gauge the mental health of citizens impacted by the Gulf closures and to detect biological changes in gill tissue of killifish. We are home to the country's only

university-owned blowout prevention training facility, which helps in training and response so that a disaster like the Deepwater Horizon oil spill can be avoided in the future. You can find out more about LSU's Response to the Oil Spill at lsu.edu/research.

Our School of the Coast & Environment is acclaimed for advancing studies in coastal sciences, oceanography and environmental science, bringing in an annual sponsored research program total that typically exceeds \$10 million. In partnership with the College of Engineering, Coast & Environment offers the state's only coastal and ecological engineering master's degree.

Our Commitment to the Coast isn't just a motto – it's something our faculty live by every day. You can find out more about the work our researchers do at lsu.edu/coast.

LSU Committed to the COAST



**COASTAL
LAND LOSS**

80% of
**US COASTAL
LAND LOSS**
occurs in Louisiana.

LSU invests nearly
\$2.5 million
toward directly ASSISTING
& SUPPORTING Louisiana's
COASTAL SMALL BUSINESSES.

MORE THAN

200
**FACULTY
MEMBERS**
ARE DOING
**RESEARCH
RELATED
TO THE COAST.**

LSU invests
\$73 million
of ACTIVE GRANT \$\$
on COASTAL RESEARCH in
Louisiana.

We currently have approximately
80 GRANTS FUNDED worth **\$14 MILLION**
SOLVING PROBLEMS related to OIL AND GAS
EXPLORATION and to EXTRACTION AND SPILL
MITIGATION in the Gulf.

“Beasts of the Southern Wild,” a 2012 film directed by Benh Zeitlin and based on a play written by Lucy Alibar, is a film about loss, courage, climate changes and human perseverance in southern Louisiana. The fictional island in the film, the “Isle de Charles Doucet,” was inspired by real communities in Louisiana’s Terrebonne Parish such as the rapidly eroding Isle de Jean Charles, threatened by erosion, hurricanes and rising sea levels. Zeitlin, along with Glen Pitre, known for such acclaimed films as “Belizaire the Cajun,” visited LSU in the spring of 2013 in an event called “From Belizaire to Beasts: Louisiana Folklife and Filmmaking.”

Inspired by Zeitlin’s portrayal of important environmental changes in southern Louisiana, three LSU faculty members shared their thoughts about the film and what it means for Louisiana and the Gulf Coast region.

Tracy Stephenson Shaffer is an associate professor in the Department of Communication Studies at LSU, where she researches and teaches courses in performance studies and film. Shaffer is a past chair of the Performance Studies Division of the National Communication Association and 2009 recipient of the Southern States Communication Association’s Performance Studies Division “Scholar of the Year” Award. Shaffer serves as the producing director of the HopKins Black Box, an experimental laboratory theatre at LSU, where she also directs original live performances.

Q: Can you describe the narrative of the film?

Shaffer:

The main character, the 6-year-old girl Hushpuppy, is the narrator, so we see the world through her eyes. As such, the Bathtub, a Louisiana bayou community south of the safety of manmade levees, is both painfully realistic and lonely and extraordinarily fantastic and wondrous.

Hushpuppy begins her story in the third person, “Once there was a hushpuppy.” Most simply, the use of a narrator and the conventions employed mark the story as a fairytale. In this way, the film audience is the audience for the tale. Fairytales both please us by the creation of a magical world beyond the world we know where anything is possible, as well as teach us lessons through the experiences of the protagonist. As a fairytale, we are asked to embrace the film’s surface but also its symbolic meanings.

Throughout the film, fairytale or mythical conventions are used. Many traditional fairytales portray a young girl or young woman who lives with her father after her mother’s death or disappearance. In addition, many fairytales center on a young person who goes on an impossible and life-changing journey complete with zany characters, evocative settings and terrible creatures. For the most part, fairytales are seen today as stories for children, but at one time, they were tales for adults that expressed the concerns of a community. Certainly, “Beasts of the Southern Wild,” as an

adult fairytale, asks us to consider life in southern Louisiana post-Katrina in new ways.

Kam-biu Liu is the George William Barineau III Professor and department chair of the Department of Oceanography and Coastal Sciences in the School of the Coast & Environment at LSU. He is recognized as a

pioneer and leader in paleotempestology, an emerging field that studies past hurricane activity by means of geological proxy techniques and historical documentary evidence. As a paleoclimatologist and paleoecologist, Liu’s broader research interests include the use of fossil pollen, lake sediments and ice cores to reconstruct the global and regional patterns of climate and environmental changes on timescales of centuries to millennia.

Q: In the film, a big storm floods the main characters’ Gulf island, called “The Bathtub.” The flood also brings salt water that begins to kill fish and animals. Can you talk about the science behind this storm, storm surge and flooding impacts in coastal regions?

Liu:

Sea level rise is certainly a major threat faced by the coastal communities of Louisiana, but this threat is long-term and incremental. A much greater imminent danger to Louisiana’s coastal populations is inundation due to freshwater flooding and storm surges caused by hurricanes. A good example is the impacts of Hurricane Isaac, which made landfall in Louisiana in August 2012. Isaac was only a category 1 hurricane according to the Saffir-Simpson intensity scale; hardly an intense hurricane by its wind speed. But this slow-moving storm dumped more than 20 inches of rain in eastern Louisiana and adjacent Mississippi. The torrential rain, coupled with the storm surge pushed up by easterly winds over Lake Pontchartrain and Lake Maurepas, caused tremendous flooding of the low-lying areas around these lakes and especially the Amite River-Lake Maurepas basin to the

BEASTS OF THE SOUTHERN WILD

By Paige Brown

west. The inundation caused significant mortality among the deer populations and other wildlife species.

It is remarkable that this storm-induced flooding occurred not on the seacoast of Louisiana, but in areas many miles inland. For barrier island communities like the imaginary Isle de Charles Doucet featured in the film – or real places like Grand Isle or Port Fourchon that sit on the frontline of Louisiana’s coastal zone – the biggest danger comes from the storm surge generated by a hurricane’s intense low pressure and strong onshore winds.

One thing is certain about the future trend of storm surges as a hazard to coastal communities: that is, on a subsiding coast subject to a rising sea level, our society’s vulnerability to the devastating effects of storm surges will greatly increase. Historically, coastal Louisiana has suffered from the devastating impacts of storm surges. In 1893, Cheniere Caminada, a barrier island community located just west of Grand Isle and probably not unlike the Isle de Charles Doucet community in the movie, was annihilated by the 16-foot-high storm surge caused by an intense land-falling hurricane, resulting in a death toll of 2,000 people. We have all seen the devastation caused by Katrina and Rita to coastal Louisiana, mostly as a result of the storm surges generated by these intense hurricanes. Extreme events like these, and their disastrous impacts, will only get worse if the trend of global warming, sea-level rise and coastal land loss continues unabated.

Nina Lam is a professor in the Department of Environmental Sciences in the School of the Coast & Environment at LSU. She has served previously as chair of the department (2007-2010) and program director of the Geography and Spatial Sciences Program at the National Science Foundation (1999-2001). Lam’s research interests include environmental health and disaster and resilience. She has received external funding to work on modeling business return in New Orleans after Katrina, community resilience assessment in the Gulf of Mexico region and coastal vulnerability modeling using a coupled natural-human system approach.

Q: Can you talk about the real Isle de Jean Charles? Is it really slowly disappearing, and why?

Lam:

Yes, the general area surrounding the real Isle de Jean Charles is slowly disappearing. If you see the map of southern coastal Louisiana, there has been a significant land loss problem. This is very well documented. The main reasons for the land loss problem have also been well documented. These include:

1. Lack of continuing sediment supply from the Mississippi River, due mainly to the elaborate levees and dam system upstream designed to control the flooding of densely populated areas such as New Orleans and Baton Rouge;
2. Land subsidence;
3. A dense pipeline and canal system for oil and gas, cargo and other industrial activities, which further exacerbates the salt water intrusion and the breaking up of the marsh land; and
4. Frequent hurricane activities and associated storm surge, generating a complex ecological response that also accelerates the land loss problem.

With the threat of global warming and sea-level rise, the land loss problem is expected to be even more severe. We conducted an analysis and published an article on this topic in 2009. In our analysis, we investigated how and where a 3-meter sea-level rise would impact Louisiana. In fact, our analysis included the entire coast of the conterminous United States, which indicated the potential flooding of Manhattan and the Potomac River in the center of Washington, D.C. We have produced a number of maps and estimates of affected populations. For Louisiana, there would be more than 1.2 million people affected by three meters of sea-level rise — if they did not move by that time — or 28 percent of the state’s population.

Want to read the full interviews with each expert? Visit www.lsu.edu/departments/gold/2013/02/southernwild.shtml.

LSU Coastal Researcher Part of National Academy of Sciences' New Gulf of Mexico Program Advisory Group

LSU Professor of Oceanography & Coastal Studies Robert Carney has been named to the National Academy of Sciences' Gulf of Mexico Program Advisory Group, developed in response to the 2010 Deepwater Horizon oil spill.

"It is an honor to work with the National Academy of Sciences helping to start a 30-year program that will link science, policy, industry and Gulf of Mexico restoration," said Carney. "When the court awarded part of the BP fines to the academy, it was in recognition of NAS' long-standing and highly effective role of solving complex issues by drawing from the highest level and breadth of national talent."

The group is tasked with creating a strategic vision and guiding the program's development and implementation. Serving for one year, the advisory group will articulate the program's mission, goals and objectives in order to develop a guiding outline of how the program will operate in its first three to five years.

"The advisory group brings distinction, expertise from diverse disciplines and a wide range of experience to the task of defining the program," said NAS President Ralph J. Cicerone.

The 24-member group draws on the science, engineering and health expertise of the National Academy of Sciences, National Academy of Engineering, Institute of Medicine and National Research Council. Chaired by outgoing NAS Vice President Barbara A. Schaal, dean of the Faculty of Arts and Sciences at Washington University in St. Louis, the group includes people with experiences in academia and industry, as well as people with deep connections to the Gulf region.

The \$500 million, 30-year Gulf of Mexico program was established as part of the settlements of federal criminal complaints against BP and Transocean Ltd. following the 2010 Deepwater Horizon explosion. It will focus on human health, environmental protection and oil system safety in the Gulf of Mexico and the United States' Outer Continental Shelf, and will fund and carry out studies, projects and activities in research and development, education and training, and environmental monitoring.

To identify broad opportunities in these areas that best meet the program's charge, the advisory group will work to understand what other organizations and agencies are doing in the Gulf region. As part of its information gathering activities, the group will conduct a series of in-person and virtual meetings in Alabama, Florida, Louisiana, Mississippi, Texas and Washington, D.C., to identify how the NAS program can make useful and lasting contributions.

The program will be run under the auspices of the National Research Council, the principal operating arm of the NAS and NAE. Together with the IOM, these private, nonprofit institutions provide science, technology and health policy



In response to the 2010 Deepwater Horizon oil spill, the National Academy of Sciences developed a Gulf of Mexico Program Advisory Group, naming LSU's Robert Carney among its members.

advice under a congressional charter granted to NAS in 1863. Chris Elfring is the director of the Gulf program at the National Research Council.

For more information about LSU's coastal research, visit www.lsu.edu/coast.

LSU Reorganizes Iconic Coastal Studies Institute

LSU has held a place as one of the world's most respected and internationally-known coastal institutions for more than 60 years, thanks in large part to the hard work, dedication and superior expertise of faculty within the Coastal Studies Institute, or CSI. With names like R.J. Russell, James Morgan, James Coleman and Harry Roberts rounding out a roster of international authorities, CSI experts set the framework for the way scientists look at coastal processes. A memorandum of understanding developed and organized by the Office of Research & Economic Development and signed by Dean Christopher D'Elia of the School of the Coast & Environment; Dean Richard Koubek of the College of Engineering; and former Dean Kevin Carman of the College of Science created a partnership realigning LSU's CSI to reflect the changing face of research.

To lead the charge, Samuel Bentley, holder of the Billy and Ann Harrison Chair in Sedimentary Geology in the Department of Geology & Geophysics has been selected to serve as director.

"In restructuring and expanding the LSU Coastal Studies Institute, we want to highlight and augment LSU's great expertise in coastal sciences and engineering, particularly as that expertise applies to river deltas, both here and around the world," said Bentley.

One of the most important roles of the new CSI will be to enhance and facilitate the coastal research enterprise of LSU faculty by offering expanded technical, administrative and financial support to CSI researchers. Another new focus is the coordination, preparation and implementation of large collaborative projects needed for a better understanding of coastal processes.

"Rapidly increasing our already impressive coastal research portfolio can have a direct effect on our state," said Executive Vice Chancellor & Provost Stuart Bell.

"Louisiana's economy is dependent upon having a healthy coast. Our industry needs it - our citizens need it."

The new CSI will serve as a primary point of contact for interdisciplinary coastal research at LSU, and will actively work to share the university's coastal activities with state and federal agencies that need such data to make informed public policy and safety decisions. It also will provide new opportunities for training and supporting the next generation of leading researchers, paving the way for continued advancements in coastal sustainability.

Interested in learning more about LSU's CSI? Read a detailed history at www.csi.lsu.edu.

Breakthrough in Seafood Safety

In 2013, LSU Associate Professor of Water Resources and Coastal Engineering in the Department of Civil & Environmental Engineering Zhiqiang Deng and his research group became the first group of scientists in the world to predict oyster norovirus outbreaks in advance. They correctly predicted the outbreak in Cameron Parish Oyster Harvesting Area 30 weeks before it occurred, providing a major breakthrough in protecting public health.

Outbreaks of norovirus, a virus that causes acute stomach and intestinal inflammation with symptoms of vomiting and stomach pain in humans, have been a significant problem for the oyster farming industry. According to the Center for Disease Control and Prevention, norovirus causes about 21 million illnesses annually. The virus typically spreads through contaminated water or food, including seafood, but can also transfer from human to human.

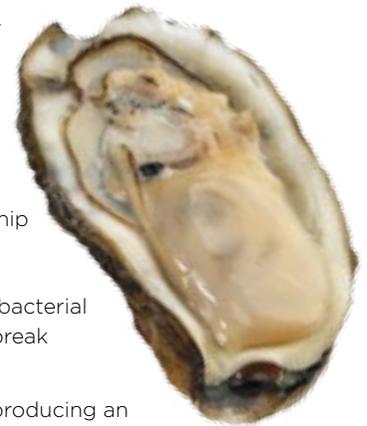
"If your friend eats an infected oyster and gets infected by the norovirus, then you may also get sick," Deng said. "That is why it is important to prevent the norovirus outbreak in the first place."

The research, conducted in partnership with the Louisiana Department of Health and Hospitals, or LDHH, uses satellite data from NASA to predict bacterial levels and associated norovirus outbreak conditions in oyster growing waters.

"Our predictive model is capable of producing an oyster norovirus outbreak alert a couple of weeks in advance," Deng said. "If the model prediction shows that the probability of an outbreak will be high in a particular time period, then we can warn oyster management organizations like the LDHH to close certain harvesting areas," Deng said.

Deng's group is also developing a website where government and public users can see real-time bacterial levels in oyster growing areas. He hopes to have a finished product website in the next few years, with the addition of surveillance cameras in growing areas to monitor harvesting activities. By linking his model to NASA data and a publically accessible website, Deng is helping oyster harvesters know in advance which oyster growing areas are safe for harvesting, and which are not.

"The most important thing is to protect the health of oyster consumers," Deng said. "That is our job."



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Three years have passed since the Deepwater Horizon oil spill of 2010, but the real impact of the spill remains to be seen, with scientists on both sides of the fence regarding long-term damages. Several LSU researchers are filling the role of ecological detectives, following the progress-or lack thereof-made by several indicator species critical to the coastal food chain.

Of Bugs and Birds

LSU's Phil Stouffer, professor of conservation biology in the School of Renewable Natural Resources, or RNR, and Sabrina Taylor, assistant professor in RNR, are studying the effects of the oil spill on seaside sparrows. Stouffer and Taylor, in conjunction with former RNR post-doc Stefan Woltmann and current post-doc Christy Bergeon Burns, are working under the umbrella of the Coastal Waters Consortium, or CWC, funded by GoMRI, the Gulf of Mexico Research Initiative. The Consortium came together in early 2012 to assess the chemical evolution, biological degradation and environmental stresses of petroleum and dispersant within Gulf of Mexico coastal and shelf ecosystems.

Seaside sparrows spend their entire lives on salt marshes, including breeding in areas known to be affected by the spill. Stouffer and Taylor are examining density, diet, movements, nest success and gene expression patterns of seaside sparrows in contaminated and control marsh areas. The group is using genetic analysis tools to determine expression of a gene in sparrows involved in detoxifying contaminants in oil.

"We want to see whether there has been an effect of the oil spill on seaside sparrows," Taylor said. "We are using a number of approaches to do that. One is to look at reproductive success and the expression of a gene that starts functioning in the presence of Polycyclic aromatic hydrocarbons, or PAHs, which is one of the toxic components of oil. This gene could be active in the liver of sparrows that are exposed to toxic compounds."

Stouffer and Taylor are working to expand knowledge of terrestrial food web effects of oil spills. While seaside sparrow biology is poorly understood, this bird species could be sensitive to environmental disturbances and used as an "indicator species" to assess the effects of oil spills, climate change, sea level rise and overall land loss in marsh ecosystems. Seaside sparrows, though not currently endangered, are a part of a larger group of birds that have shown vulnerability to changing environments. One subspecies, the dusky seaside sparrow, has gone extinct, and another, the cape sable seaside sparrow, in the Everglades, is endangered.

"These birds live on the edge," Stouffer said. "They live in salt marsh. Sea-level rise associated with climate change, increasing storm intensity, marsh loss through subsidence – all of these processes are going to hurt this bird."

Stouffer and Taylor work with other professors at LSU, including Linda Hooper-Bui, associate professor of entomology, and Eugene Turner, Boyd Professor, LSU

Distinguished Research Master and Shell Endowed Chair in Oceanography and Wetlands Studies, to look at multiple levels of marsh food webs and the effect of oil on these systems.

"We are hoping that in this second year of data collection, we can begin understanding how the effects that the entomologists are seeing relate to effects that we will see in the birds," Burns said. "We are trying to understand how the food web as a unit is responding to the oil."

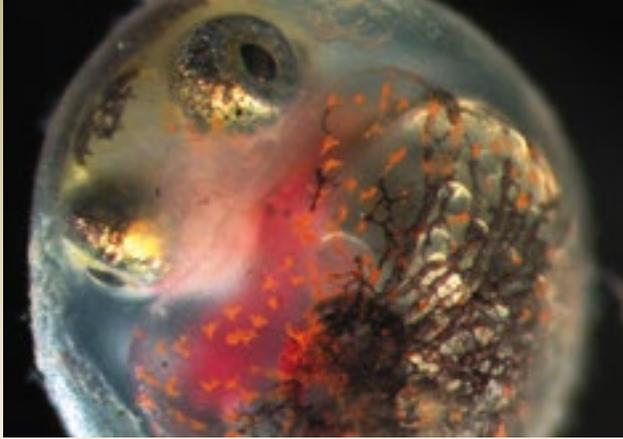
Stouffer's group is looking at movement of seaside sparrows across the northern Gulf, to determine how much they are exposed to oil-contaminated sites. They are investigating population levels and reproductive success of the species. Burns, a current post-doc in the group, plans to look at how hormone levels in the species may change in response to the oil exposure.

According to Stouffer, if the productivity of insects is lower in oiled areas of the marshes, as Hooper-Bui has found in her research, then seaside sparrows might have to resort to gaining nutrients from lower on the food chain in order to get enough energy. Stouffer's group is trying to synthesize data from Turner's and Hooper-Bui's research with their own studies on terrestrial birds such as seaside sparrows. By combining notes, researchers at LSU are looking at the effects of oil spill on multiple levels of marsh ecosystems.

"This is a system that is very important to Louisiana," Stouffer said. "What we find in these birds may show that the contamination from the oil spill has made it out of the water and into the food web at large."



LSU's Phil Stouffer and his research team are studying the impact of the 2010 oil spill on seaside sparrows, which spend their lives in the same salt marshes that were covered in oil for months.



LSU researchers have found biological impacts of the oil spill on killifish, which are considered to be a bellwether species.

A Fish Tale

LSU Associate Professor of Biological Sciences Fernando Galvez, together with Benjamin Dubansky, a recent LSU Ph.D., and University of California-Davis researcher Andrew Whitehead, have found that exposure of Gulf killifish embryos to sediments from oiled locations caused cardiovascular defects, delayed hatching and reduced overall hatching success.

“Although the Deepwater Horizon oil spill has passed the attention of most of the nation, our data warn of developmental abnormalities in coastal fish that should be further investigated,” said Fernando Galvez, LSU associate professor in the Department of Biological Sciences and one of the principal investigators on the supporting grant. “We are finding that embryos exposed to oiled Louisiana sediments are hatching at lower frequencies and are showing developmental abnormalities, and that embryos that do go on to hatch successfully are smaller and listless.”

Another concern is that many species important to both the ecosystem and to Louisiana’s seafood industry share habitat with the killifish, including blue crabs, shrimp, oysters, redfish and more.

“Adult [killi]fish collected from heavily oiled locations in Louisiana marshes showed evidence of exposure to crude oil long after the visible oil had disappeared from view, and when Gulf killifish embryos were exposed to sediments collected from the most oiled location, their overall hatching success was significantly reduced, there was a time delay in hatching, and this was associated with developmental heart defects in these fish,” said Dubansky, who is beginning a post-doctoral position in Warren Burggren’s lab in the Developmental Integrative Biology Cluster at the University of North Texas, where he will continue his work on the effects of environmental stressors on vertebrate development. “The developmental deformities found are textbook effects that we see when fish are exposed to the toxicants in crude oil, and indicate that the developmental success of these fish in the field may be compromised.”

LSU shares research findings from Deepwater Horizon oil spill

In the three years since the Deepwater Horizon (DH) disaster leaked an estimated 4.9 million barrels of oil into the Gulf of Mexico, researchers around the globe have worked to understand the impact the spill has had and will have on the Gulf.

On April 22, The LSU Office of Research & Economic Development held the “Louisiana Research Perspectives on the Deepwater Horizon 2010 Spill: The Good, The Bad & The Ugly,” conference to discuss research generated to date with a strong focus on what has been learned and what new research questions this knowledge generated. About 150 people attended the event, including representatives from BP, Gulf of Mexico Research Initiative and the Louisiana Governor’s Office.

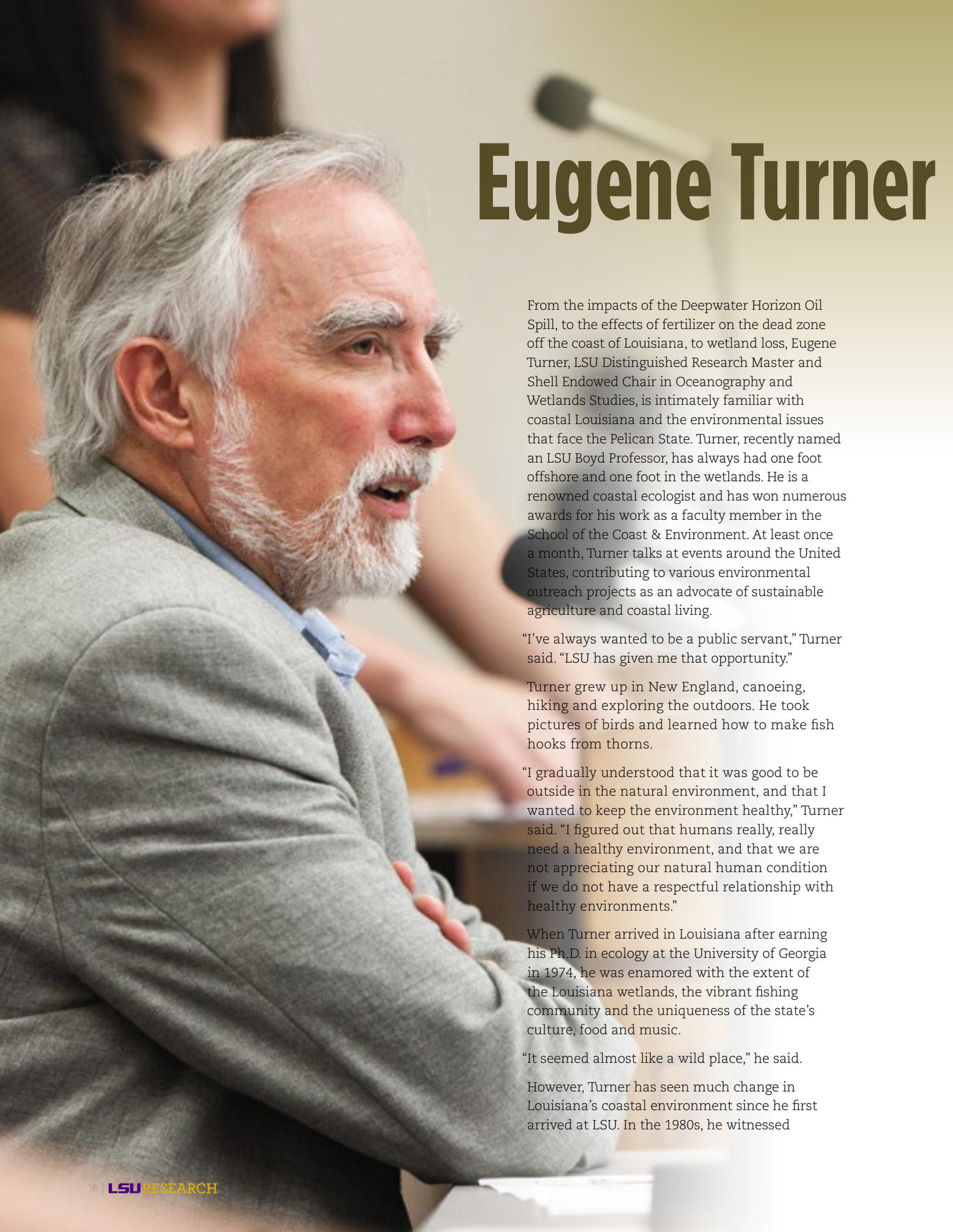
“LSU was a leader in the response to the oil spill and remains at the forefront of research related to that event,” said Vice Chancellor of Research & Economic Development Kalliat T. Valsaraj. “This conference served as an important mechanism to acknowledge the third anniversary of the incident, share our results with other researchers and, perhaps most importantly, continue the conversation about the long-term impacts of the spill. It also highlighted the future research needs in the general area of oil spill remediation.”

Broken into four separate thematic sessions and a poster session, the conference brought together LSU faculty as well as researchers from other universities across the southern region and industry leaders to discuss the impact of the spill.

Each of the sessions focused on broad questions pertaining to various aspects of the disaster. Each session had a number of concurrent presentations by researchers at LSU and elsewhere delving deeper into the many nuances of completed and ongoing research.

- Session I: Fate of DH Crude Oil on Louisiana Environments Speaker: Chris Reddy - Woods Hole Oceanographic Institution
- Session II: Impacts & Effects of DH Crude on Louisiana Environments at Multiple Scales Speaker: John Teal - Woods Hole Oceanographic Institution
- Session III: Engineering, Energy & Economic Aspects Speaker: Scott Socolofsky - Texas A&M University
- Session IV: Social Sciences & Public Health Aspects Speaker: Maureen Lichtveld - Tulane School of Public Health & Tropical Medicine





Eugene Turner

From the impacts of the Deepwater Horizon Oil Spill, to the effects of fertilizer on the dead zone off the coast of Louisiana, to wetland loss, Eugene Turner, LSU Distinguished Research Master and Shell Endowed Chair in Oceanography and Wetlands Studies, is intimately familiar with coastal Louisiana and the environmental issues that face the Pelican State. Turner, recently named an LSU Boyd Professor, has always had one foot offshore and one foot in the wetlands. He is a renowned coastal ecologist and has won numerous awards for his work as a faculty member in the School of the Coast & Environment. At least once a month, Turner talks at events around the United States, contributing to various environmental outreach projects as an advocate of sustainable agriculture and coastal living.

“I’ve always wanted to be a public servant,” Turner said. “LSU has given me that opportunity.”

Turner grew up in New England, canoeing, hiking and exploring the outdoors. He took pictures of birds and learned how to make fish hooks from thorns.

“I gradually understood that it was good to be outside in the natural environment, and that I wanted to keep the environment healthy,” Turner said. “I figured out that humans really, really need a healthy environment, and that we are not appreciating our natural human condition if we do not have a respectful relationship with healthy environments.”

When Turner arrived in Louisiana after earning his Ph.D. in ecology at the University of Georgia in 1974, he was enamored with the extent of the Louisiana wetlands, the vibrant fishing community and the uniqueness of the state’s culture, food and music.

“It seemed almost like a wild place,” he said.

However, Turner has seen much change in Louisiana’s coastal environment since he first arrived at LSU. In the 1980s, he witnessed

Named Boyd Professor

By Paige Brown

the discovery of the dead zone off the coast of Louisiana, an oxygen starved region of water the size of Massachusetts caused by nutrients and nitrogen fertilizing algae and other small organisms in the water column as they flow down the Mississippi River. In fact, Turner was instrumental in the discovery, as his research contributed to initial measurements of hypoxia, or oxygen depletion, in what is now known as the dead zone. Turner's research on this environmental problem has reached all the way up the Mississippi River to farms in Minnesota, where he has consulted with farmers and non-governmental organizations in advocating methods for reducing fertilizer run-off.

"It is a wicked problem," Turner said. "The nitrogen in the river can damage wetlands as well as the gulf. There is a need for sustainable farming practices."

Turner has also contributed significantly to research that showed for the first time both the value and the delicate balance of the Louisiana wetlands. In the aftermath of peak wetland dredging in the 1960s and peak nutrient run-off in the 1970s, Turner and colleagues at LSU observed significant wetland loss and the environmental effects of this loss for the first time.

"Before the 1970s, we considered the wetlands as wastelands," Turner said. "We handed out permits to do anything in the wetlands. But in 1974, we discovered that the fish harvest offshore directly depends on wetland areas, as many species depend on the wetlands for food and reproduction."

Turner has received numerous awards for his research on the Louisiana wetlands, including the National Wetlands Award for science research sponsored by the Environmental Law Institute, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, USDA National Resources Conservation Service and NOAA National Marine Fisheries Service. In the aftermath of the BP oil spill in 2010, Turner also began studying the effects of oil on the roots and leaves of marsh plants. According to Turner, he hopes to soon have publishable findings from his research of oil spill impacts in the marsh.

"The marsh plant roots hold the soil together; if there are fewer of them, then the shoreline may erode faster

than it would otherwise," Turner said. "We dig up plants and measure how many roots are in the soil, and also perform chemical analyses of the leaves and mud to determine the oil content."

One of Turner's biggest research concerns currently involves global climate change. He is working with Zhu H. Ning at Southern University on a climate change education project titled "Preparing for a Changing Climate: Potential Consequences of Climate Variability and Change," which involves developing courses and a curriculum to help students learn about the impacts of climate change and adaptation strategies.

"I think it is important right now to have clarity on coastal issues, before we begin work towards coastal restoration," Turner said.

Turner feels fortunate for his time at LSU, and for the wonderful graduate students that he has advised over the last 40 years.

"My graduate students start to learn the dance of discovering truth and clarity about coastal issues with balancing the social context," Turner said. "Our allegiance is to the objective science first. But it is also important to find a way to have a narrative that appreciates the good things about human society."

Despite being named a Boyd Professor, the highest recognition for a faculty member at LSU, Turner is humble about his research breakthroughs at LSU.

"I am just a small piece," Turner said. "There are wonderful people on this campus who are doing excellent work but not getting awards. I just feel fortunate to have been here at LSU for 40 years."

In his future years at LSU, Turner plans to begin publishing his data on oil spill impacts in the marsh and to continue his research and outreach on global climate change impacts in the Gulf region. He will also continue giving talks around the country for environmental education and outreach.

"I will give back to the public good as best I can," Turner said.

FUELING THE FUTURE

By Jenny Linscott

The story of this century is likely to be a story of energy. As our global appetite for energy continues to grow - estimated to increase more than 50 percent by 2035 - so will the emissions from the fossil fuel industry. Supplying power to our industrial systems, our cars, even our mobile devices - and doing so in ways that are environmentally and economically viable - is a complex challenge.

To meet it, LSU alumni are bringing creative energy innovations into the commercial sector. Their businesses, housed at LSU's Louisiana Business and Technology Center, re-imagine energy technologies at every level, from the nanoscale to the industrial scale.

High-tech on the Nanoscale

For Wanli Xu, new energy technology on the nanoscale is yielding big results. Xu is a materials scientist at Electrochemical Materials, where her innovations are driving surface modifications on silicon nanoparticles for use in lithium-ion batteries.

Lithium-ion batteries are all around us. Chances are, there's one near you right now, powering a mobile device like a laptop or a smartphone. But at the end of the day, lithium-ion batteries still keep us tethered to electrical sockets. Improved capacity would enable our devices to run dramatically longer on a single charge.

Conventional lithium-ion batteries work by shuttling lithium ions back and forth between a cathode made of metal oxide, and an anode made of graphite. Xu and her team are re-engineering the chemical composition of the anode, using a new material - silicon - with a charge capacity 10 times greater than graphite.

As Xu explained, the electrical properties of silicon have made it conceptually promising for more than a decade. But silicon nanoparticles tend to swell and polymerize when combined with lithium ions. Lithiated silicon undergoes a volumetric expansion of more than 300 percent, compared to only 10 percent for graphite. Bloated particles tend to crack, rupturing electrical contact, and they also undergo unwanted surface reactions.

To combat this problem, researchers first turned to nanoscales - particles and structures from 1-100 billionths of a meter in size.



LBTCA

“When structures shrink down to a certain size you don’t have polymerization problems,” said Xu. “But even on the nanoscale, we still see capacity fading. We assumed that nanostructure was the final solution for silicon nanomaterial, and actually it’s not. So the next step we’re doing is surface modification.” Coating silicon nanoparticles protects them from surface reactions and enables them to shrink and expand in a composite matrix without pulling off.

Electrochemical Materials was awarded a prestigious Phase I Small Business Innovation Research, or SBIR, grant from the National Science Foundation to explore the feasibility of their surface modifications. “The results were good,” said Xu, principal investigator on the grant, and the SBIR program agreed. Earlier this year, she was awarded a Phase II SBIR grant to take this research to the next level. “A Phase II grant gives us the opportunity to get to the real world, to a commercial product,” she said. “We are patenting our technology and also our process.”

That process involves the recycling of silicon sawdust, a byproduct in the manufacturing of silicon materials that is traditionally treated as waste. Electrochemical Materials grinds up the sawdust, modifies its surface structures, then combines it with graphite and a polymer binder to produce a raw material that battery manufacturers can use for next generation lithium-ion anodes.

New anodes could increase battery capacity 30-40 percent effectively and efficiently, without demanding a costly overhaul in battery manufacturing. “We call this a drop-in method,” said Xu, “which means that manufacturers don’t need to re-tool the whole process. They just need to change the recipe of their mix.”

In the consumer electronics industry, improved capacity means your smartphone can stay charged through an increasing volume of high-energy demands, such as Web browsing, emailing and text messaging. As the number

of mobile-connected devices in the world is poised to reach the number of people - 7 billion - by early next year, the effects are amplified.

In the transportation industry, the effect of modifications at the nanoscale could be even more profound. In 2011, President Obama announced a target of one million electric cars on the road by 2015. But the lithium-ion batteries that currently power electric vehicles are bulky and expensive, with a comparatively limited driving range. Improved batteries would make electric vehicles competitive with gasoline-powered vehicles, greatly reducing fossil fuel dependence and its associated pollutants.

Once new anode technology hits the marketplace, its advantages are long-reaching. If researchers can eventually improve the cathode component of lithium-ion batteries, battery capacity will continue to increase, paving the way for a transformed energy economy.

For a talented young researcher like Xu, Electrochemical Materials has provided an opportunity to carry her work on silicon nanoparticles from the lab bench to the marketplace. The two worlds, she explained, have their differences.

In the commercial world, promising science must be wedded to practicality. “In academic research, you are interested in a topic and want to explore it,” she said. “You want to know why, what mechanisms lie behind it. But in industries like engineering, you want results. You want to achieve a certain goal.”

Portable Engines

Across the way at LBTC, mechanical engineer Dr. Jason Hugenroth is bringing a different kind of portable energy into real-world situations. Hugenroth is founder and president of Inventherm, an engineering research and development company with the capacity to move



innovations from concept to prototype to practical implementation, right in its own lab.

Inventerm focuses generally on thermal systems and rotating machinery, but last year, Inventerm was awarded an SBIR grant to explore meso-scale combustion based power generation systems, or MPGS. These mid-sized devices would use liquid fuels to power portable devices.

“Other research programs have looked at scaling down macro-engines,” Hugenroth said. “The problem was that it just didn’t scale down well, so the physics of what happened at the small scale led primarily to internal leakage of gases and heat transfer effects.”

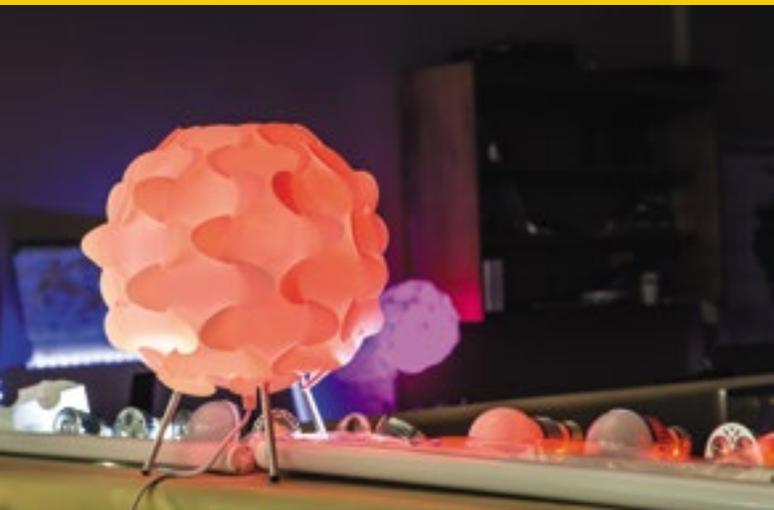
Instead of scaling down an existing structure, Hugenroth is taking a different approach, designing machinery and a thermodynamic cycle that are originally intended to function on a meso-scale. The prototype on his desk is more on the order of a car’s cigarette lighter than a car’s engine. “This isn’t meant to power your house or to go in your car, but it does work well at this size,” he said.

The lure of liquid hydrocarbon fuels is their energy density, tens of times greater than battery technologies. “We’re going for about 7-10 times the life of a battery in the same package size. If you make accommodations for a larger fuel tank, or just swapping out a fuel cell, you don’t have to recharge. You just keep going.”

For a soldier, this means extending the use of vital field equipment. Hugenroth cited cooling garments, which prevent exhaustion in hot climates. Currently, they operate for only a few hours at a time. But extending that operation from two hours to 20, or providing a fast, easy method of refueling in the field, means that equipment works better for longer.

Meso-scale systems would also allow for energy flexibility. They might accommodate a variety of different liquid fuel types, from methanol to military jet fuel, for different applications.

Hugenroth is completing the experimental phase of their research into MPGS devices. With a machine shop



LSU alumni partnered with the university’s Louisiana Business and Technology Center, are developing businesses combining the search for cleaner, more efficient forms of energy. In addition to creating innovative solutions to the problem of fossil fuels, these entrepreneurs also contribute considerably to the Baton Rouge and Louisiana economy.

LBTC Small Business Incubator



25,000 Sq. Ft.

and a testing lab at Inventherm, he's able to design and manufacture his own prototypes. Now, he'll begin to test how they work, evaluating their viability for the commercial energy market.

Turning the Tides

At New Oil, Gary Miller's prototype takes up the entire room. New Oil uses a patented process capable of transforming biomass into usable energy on an industrial scale.

Hydrothermal liquefaction uses highly heated, highly pressurized water to dissolve wet biomass and recover the energy packed inside. "Very hot water will dissolve just about anything, even aluminum," Miller said. "It depolymerizes, taking the long chain polymers and breaking them down into smaller chemicals."

Miller came to New Oil uniquely equipped to tackle the challenges associated with this kind of large-scale pressure-cooking. As a chemical engineer with a spectrum of research experience - he studied high temperature reaction flows at LSU and worked in research and development at DOW Chemical Company - he began looking at the feasibility of turning biomass into renewable transport fuels.

Any cellulosic material might provide the kind of biomass needed for this process. Grasses, waste products from the pulp and paper industries, plant material removed by forestry services, even corn stover—the stalks that are traditionally left in the field after a harvest—are cheap and readily available. So, too, is sewage sludge, a product that municipalities currently pay to dispose of in landfills.

"The chemical challenge with biomass is that the cellulose is 50 percent oxygen," he said. "Effective fuels need very little oxygen."

Last year, Miller built a pilot plant, a small industrial system used to test his process before making it bigger. "The process must continually flow to be economically feasible," he said. Tabletop experiments have allowed

him to test the process in pieces, one step at a time, but here, the process will run continuously in a fashion analogous to a full-size industrial plant.

The results of the pilot plant experiments moved the company in a new direction. "Immediately we started getting good results, but they weren't fuels. Instead we were getting chemicals."

Under commercial constraints, it wouldn't be economically advantageous to turn these chemicals into fuel. But the chemicals themselves are valuable—more valuable, in fact, than the fuel itself. Miller explained that oil refineries turn out more than just gasoline. They also turn out feedstocks for chemical plants, small pieces left over from the refining process that are then re-built into plastics.

His process creates the same feedstocks, using a renewable source. "We produce them in one piece. So we can package them and ship them out to plastics manufacturing companies."

For Miller, affordable fuels and plastics made from renewable processes are an inevitability. As oil production moves into deeper, more complex, and more dangerous territory - from deep-sea wells to tar sands - it becomes more costly.

"Right now, it's pretty clear that civilization is in a transitional period. We're transitioning from fossil fuels to something else unknown. In 200 years, we will have made that transition. The difficulty is what we do while we're in this transition, how we handle that over the next 40, 60, 80 years."

Necessity, as they say, is the mother of invention. The energy economy in the coming decades will have to tackle needs on an unprecedented scale. In the process, it will be fueling bold scientific research, groundbreaking innovations and economic development around the globe.





CAMD Receives NSF Grant for New Wiggler, Paving the Way for New X-ray Experiments

By Paige Brown

In the scientific disciplines of chemistry, biology and materials science, seeing is often believing. The problem for scientists in these disciplines, however, is that chemical reactions and small-scale chemical and structural changes in materials are not directly observable by the human eye. In fact, even traditional light microscopes and x-ray sources are not powerful enough to allow scientists to see the changes that occur in flame retardant plastics as they are exposed to heat, for example.

For scientists at LSU's Center for Advanced Microstructures & Devices, or CAMD, the impossible in chemical vision is about to be made possible. The National Science Foundation, or NSF, awarded LSU \$1.26 million to purchase and install a new superconducting multi-pole wiggler, or MPW, at the CAMD synchrotron ring. The principal investigator on the NSF grant is Professor Marcia Newcomer, a protein crystallographer and past chair of the LSU Department of Biological Sciences.

The J. Bennett Johnston Center for Advanced Microstructures & Devices, more commonly referred to as CAMD, was originally established in 1988 with a \$25 million grant from the Department of Energy and funds from the Louisiana legislature. Serving as a state resource for microfabrication and synchrotron science, the center currently brings in more than \$11.5 million from LSU principal investigators annually, and is the foundation for more than one-third of all LSU patents. In the last five years, 124 undergraduates, 162 master's students, 200 Ph.D. candidates and 60 post-docs have been trained at the facility. More than 70 LSU faculty members from 19 departments across campus use the facility for research, as well as 155 faculty and industrial users from around the world. External funding has increased exponentially over the last five years, and research done at CAMD has impact on everything from energy efficiency to drug development.



“The wiggler basically allows a 1990s synchrotron to perform at the level of a 2013 synchrotron,” said Les Butler, professor in the Department of Chemistry.

CAMD’s new multi-pole wiggler is essentially a superconducting magnet, cooled with liquid helium, that will force the electrons circling in CAMD’s particle accelerator, or synchrotron, to quickly move side-to-side in a wiggling motion. These quick changes in direction cause the electrons from CAMD’s synchrotron source to emit more high-energy X-rays. The wiggler will increase the ability of CAMD’s synchrotron to produce high-energy X-rays by 8 to 10 fold. These X-rays can in turn be used to determine the structure of proteins, to determine the nature of toxic metal atoms in pollutants, and to image physical and chemical changes in materials over time, among other uses.

Butler and his team plan to use the intense X-rays made possible by the wiggler to investigate the dynamic material and chemical properties of plastics and batteries. In an ongoing project started at the Advanced Photon Source, or APS, near Chicago, Butler and his team are investigating the changes in flame retardant plastics designed and fabricated by a local chemical company, Albermarle Corporation. Scientists at Albermarle are currently using a difficult Underwriter’s Laboratory “flammability test” to investigate and test new materials, a test in which the flammability of a material is observed without collecting significant chemical information. A new X-ray optical technique known as phase-contrast imaging – coupled with the X-ray output made possible at CAMD by the new multi-pole wiggler – will allow Butler and his team to actively observe the physical and chemical changes in Albermarle’s flame retardant polymer blends while samples are burnt.

“New X-ray optics are sensitive to the X-rays that go through a sample but are very slightly deflected,” Butler said. “These optics have allowed a new generation of X-ray imaging called phase contrast imaging, which works well with tissue samples and plastic samples, for example. Worldwide, this is a new technique, with possible applications in mammography and other forms of cancer imaging.”

Scientists at the National Institutes of Health, or NIH, have been working at APS in developing new phase-contrast techniques for improved cancer imaging. For breast radiology, several cancer types have been reported to alter the radiation contrast of breast tissue, providing a diagnostic means to identify breast cancer. A multi-pole wiggler attached to a synchrotron ring can provide the highly specialized X-ray beams required to investigate subtle change in radiation contrast of tissues and other materials. While CAMD is not a clinical imaging site, the proposed multi-pole wiggler will

facilitate projects relevant to research on breast cancer diagnostic imaging and therapeutic techniques. The Mary Bird Perkins Cancer Center is receiving funding through Department of Defense, or DoD, for exploration of new radiation treatment methods, which will be investigated in conjunction with LSU at CAMD.

“We are using phase-contrast imaging techniques to test the material properties of batteries and plastics,” Butler said. “We have high hopes for X-ray phase-contrast imaging at CAMD.”

Together, Butler and Henry Bellamy, associate professor and Research and Protein Crystallography Beamline manager at CAMD, contributed significantly to the NSF proposal that enabled CAMD’s purchase of the wiggler. The new MPW was designed and constructed, to specifications set by CAMD, by the Budker Institute in Siberia, Russia, a world leader in this technology, having designed and built wigglers for almost every X-ray light source facility in the world. Weighing about 4 tons, the CAMD multi-pole wiggler is one of the biggest and most powerful of its kind in the world. It will generate an extremely intense beam of penetrating X-rays which will open up many new research opportunities at LSU.

“After being shipped to CAMD in separate pieces a few weeks ago, the magnet has been assembled by a team of Russian engineers and technicians,” said Victor Suller, associate director at CAMD. “They have now gone home and we await the imminent arrival of the second Russian team, this time physicists and engineers, who will work with CAMD staff to install the multi-pole wiggler into the accelerator. After being tested at its maximum magnetic field, 7.5 Tesla, the accelerator will be reconfigured to operate with the wiggler and come the fall it will be generating its beam of X-rays for research.”

Other applications for the X-rays produced by the wiggler include protein crystallography, X-ray spectroscopy and tomography, an X-ray technique for imaging plane sections of a solid 3-D object. Amitava Roy, associate professor at CAMD, says that the MPW will also expand the capability of the X-ray absorption spectroscopy program at CAMD, allowing researchers at LSU to study how elements are bound in a material, be it inside a catalyst for oil refining or an environmental contaminant.

“We are very excited about the new research that this instrumentation will enable in studies of energy, the environment, medicine and drug discovery,” said Richard Kurtz, interim director of CAMD.

In 1964, John O'Neill, now a world-renowned ornithologist who earned his Ph.D. in zoology at LSU and served as director of the LSU Museum of Natural Science, or LSUMNS, returned from an expedition to Peru as a college student with a large, brightly colored tanager no scientist had seen before. The bird, which boasts brilliant orange throat feathers and impressive iridescent blue wings, turned out to be not only a new species but also a new genus of tanager. This was the first time in a decade that anyone had discovered a new genus of bird. O'Neill described the bird in an official scientific publication under the name *Wetmorethraupis sterrhopteron*, which is

To determine vocal differences among all those species, Parker made thousands of recordings of birds in South America, and he eventually deposited around 10,000 recordings at the world's largest archive of bird vocalizations at the Cornell Laboratory of Ornithology. Even more impressively, Parker had basically started from scratch because so few of the vocalizations of the 3,000 species of South American birds were known.

In the late 1970s, Remsen arrived at LSU, drawing lots of attention to the university and the museum with the publication of several important papers as a result of fieldwork in Peru and Bolivia. Since his arrival, LSU

A Legacy of

Birds

It all started with the Orange-Throated Tanager.

By Paige Brown

currently on the IUCN Red List of Threatened Species¹ because it is still known only from a tiny, remote area in northern Peru and adjacent Ecuador.

O'Neill's discovery sparked renewed ornithological interest in exploration and fieldwork in South America, and drew new generations of talented faculty and graduate students interested in bird research to LSU. Among these were Theodore "Ted" Parker, LSU ornithologist and expert in bird voices, Van Remsen, current Curator of Birds at LSUMNS, and Dan Lane, presently a volunteer research associate at LSUMNS who earned his master's from LSU in 1999.

"Between O'Neill and Parker, LSU's reputation as an important bird collection really took off," Lane said. "Ted Parker's major contribution to ornithology was making an effort to get to know the voices of South American birds in order to detect and identify them."

personnel including Dan Lane have discovered and described 27 new species of birds from South America alone since O'Neill's Orange-Throated Tanager in 1964, all as a byproduct of their research on the biology of tropical birds.

Remsen invited Lane to LSU in 1995 as a master's student, and Lane has been involved in LSUMNS ever since. Fate brought Lane and O'Neill together when Lane first visited the museum as a potential graduate student.

"I guess he thought I had promise, so he offered me a position on an expedition to Peru in 1996," Lane said.

That expedition proved to be an extraordinary one for Lane – an "undeserving start" for the young ornithologist, as Lane himself describes it.

On the top of a lonely mountain in central Peru, while tape-recording bird calls for his research, Lane spotted a striking bird with black, red, yellow and white plumage. The mountain where he found the bird



supports a patch of “cloud forest” at an altitude of 1,200 meters and above, a high “island” of habitat that may be among the most isolated areas of cloud forest in South America.

“I was the first person to see the bird, and recognize what it wasn’t, because it had no name,” Lane said.

Lane had discovered a new species of barbet—the Scarlet-Banded Barbet—a bird related to the toucans. Lane’s bird has bright yellow feathers on its belly and a regal band of red feathers across its chest.

O’Neill and Lane officially described the bird in 2000, publishing a paper^{2,3} in which they gave the bird an official scientific name, *Capito wallacei*, and documented its differences from all other related species.

For the better part of 15 years, Lane’s bird was only known from that single mountain where he discovered it, until it was spotted again at a new site over 100 kilometers from the original site. The bird is now known to have a small range in central Peru, and is rated as “vulnerable” by BirdLife International and IUCN.

Several years after Lane’s discovery, Cornell University undergraduates Glenn Seeholzer and Mike Harvey, who are now graduate students at the LSU-MNS, found a barbet related to the Scarlet-Banded Barbet and described it as yet another new species: the Sira Barbet, or *Capito fitzpatricki*⁴.

“It looks similar, but distinctive,” Lane said. “It is not really clear how closely related the two are, but they are obviously more closely related to each other than they are to other known species of barbets.”

These discoveries make for a great track record for LSU ornithologists and the Museum of Natural Science. With the work and time required to both find and describe a new species of bird, it is rather incredible that Lane, who essentially volunteers for LSU in his free time, recently helped publish the description of yet another new bird species from Peru.

“LSU tends to attract people with a lot of talent, as far as detecting and identifying birds,” Lane said. “But on top of that, the fact that we are actively taking specimens, and that we have them here in the museum, means that we can make comparisons that people who just go and take photographs of the birds would not be able to do. As a result, we are able to detect new species that others may have passed by.”

Getting to know the voices of the birds has also been a tremendous help to LSU’s ability to detect new species.

“Thanks to the legacy of Parker, LSU ornithologists include some folks with excellent ‘ear skills’ who also can detect differences in vocalizations among related birds,” Lane said.

Another of O’Neill’s original bird discoveries is a good example of LSU’s superior ability for new species detection. In 1961, a young O’Neill was in the jungle town of Pucallpa on the banks of one of the largest Amazonian rivers in Peru, the Río Ucayali, when he collected a drab brown bird that looked similar to Hauxwell’s Thrush. When O’Neill brought the specimen back to the LSUMNS, it was originally catalogued as a Hauxwell’s Thrush, or *Turdus hauxwelli*, a common species related to the American Robin. Later, however, O’Neill observed that his specimen and others from the region had a brightly colored beak and a bare ring of orange skin around its eye, characteristics not observed in Hauxwell’s Thrush.

When O’Neill described these differences to Lane in the late 1990s, Lane took a special interest in the new bird.

“The differences stuck with me,” Lane said. “Then, when I was in Peru in 2002, I managed to see one of O’Neill’s brown birds. I recognized the green color on the bill that isn’t present in the common Hauxwell’s Thrush.”

But Lane noticed something else that was odd about the bird. The bird seemed to be giving a strange, whining cat-like call unlike the call of Hauxwell’s Thrush. After analyzing many bird voice recordings back at the museum, Lane confirmed that O’Neill’s 1961 bird had a truly different call – a telltale sign that the bird was actually a completely different species.

“The sounds that the birds make are actually very important to have on record, for comparisons with other known species,” Lane said.

Analysis of its DNA by LSUMNS graduate student Luciano Naka was the icing on the cake that confirmed O’Neill and Lane’s predictions about their unique thrush.

“The DNA analysis revealed that this bird is actually closely related to a different species of thrush, the Bare-eyed Thrush in northern South America,” Lane said. “So,

clearly our bird and the Hauxwell’s Thrush were two different species, but our bird had no name. So that was a bird we had to describe to science.”

In 2011, O’Neill and Lane described the Varzea Thrush, or *Turdus sanchezorum*, in an official scientific article in a major ornithological journal. Although the Varzea Thrush had been seen for nearly 80 years before O’Neill and Lane described it as a new species, other ornithologists had not realized that the bird was not simply a variation of the more common thrush species. With the superior specimen documentation, analyses of vocalizations and DNA analysis available at LSU, O’Neill and Lane were able to confirm that they actually had a new species on their hands.

“It was kind of fitting that the last new bird O’Neill has described was in fact one of the first he encountered,” Lane said. “He didn’t know it at the time, but he encountered this bird on his very first trip to Peru.”

Today, O’Neill’s legacy for discovery of new bird species is being carried on by Lane and others. The final volume of *Handbook of Birds of the World* will feature a stunning 15 new species of birds from Amazonia alone, some of which will be described by LSUMNS research associate Bret Whitney.

“We have a number of birds from Peru and Bolivia that we are still trying to gather enough on to finally describe and publish,” Lane said. “The thing that I find most exciting, is not so much the discovery of new birds, but going to places like Peru, which has the second highest number of species of birds of any country in the world.”

The leading country for number of bird species is Colombia, which harbors a whopping 1,871 species as of 2009. Peru comes in close second, with around 1,844 species. For comparison, the USA only has around 650 breeding species. The Andes mountain range in Colombia and Peru support a diversity of bird life unknown in other parts of the world.

“Mountains and valleys are basically what cause these evolutionary processes, because isolation of particular habitats causes and allows species to differentiate,” Lane said. “South America has more bird species than anywhere else in the world. It is estimated that there are about 10,000 species of birds in the world, of which about 3,300 occur in South America.”

Lane says that South America still has a lot to be discovered. Despite ongoing damages to the Amazon rainforest, large areas of intact habitat still exist that remain essentially unexplored.

“The Andes are still fairly impenetrable in places,” Lane said. “There are places that we can go that have not yet been explored, where we can still find new species. That



The bird collection at LSU's Museum of Natural Science is home to nearly 190,000 specimens, making it one of the top 10 such collections in the world.

is one of the things that we do here at LSU – we are conducting expeditions into areas that have not been well surveyed in the past.”

The LSUMNS, which was established in 1936, has grown from its original 30-50 specimens to nearly 190,000 specimens and is now the ninth-largest collection in the world in number of specimens. However, it is perhaps the largest in the world in terms of data, with more than 60,000 specimens cross-linked to the LSUMNS DNA collection, itself by far the largest of its kind in the world.

“We have all these new molecular techniques, and the technology is getting cheaper to conduct DNA-based evolutionary tree analyses,” Lane said. “I think it is a basic need in science, especially in biology, to find out how species are related to one another.”

The frozen tissue and DNA collection at LSU, officially known as the Genetic Resources collection allows researchers such as Lane to investigate how birds are related to one another evolutionarily. Although many bird species may have similar appearances due to convergent evolution, DNA analysis can reveal that these birds are actually distantly related on the evolutionary tree. This was the case for the Varzea Thrush and the Hauxwell's Thrush.

“Convergent evolution has fooled people, repeatedly,” Lane said. “For example, falcons and hawks have always been thought to be closely related to one another due to their similar appearances. It was only recently that DNA analyses showed that falcons are actually related to passerines, or perching birds, whereas hawks are more closely related to a different group of birds, which is shocking considering how similar they look.”

Today, ornithologists at LSU document a wealth of information with each bird specimen collected in the field. As well as collecting tissue samples for DNA analysis, researchers document the weight, the sex, the color of the eyes and bill, the contents of the stomach, the habitat in which the bird was collected, and the molt and the reproductive phase of the bird.

“New birds are popping up all the time,” Lane said “It is just a question of being aware of the possibility. The discovery of the Orange-Throated Tanager in Peru really cranked it up to 11 for us. LSU has had a great track record of describing new species, more so than any other university or museum in the last 50 years. We are really trying to document the diversity of bird life.”

¹ <http://www.iucnredlist.org/details/106009332/0>

² <http://www.bioone.org/doi/abs/10.1642/0004-8038%282000%29117%5B0569%3AAASNOB%5D2.0.CO%3B2>

³ <http://www.museum.lsu.edu/lane/O'Neill%20et%20al.%20Capito.pdf>

⁴ <http://www.jstor.org/stable/info/10.1525/auk.2012.11250>

If Bones Could Talk: LSU FACES Lab uses DNA databases to solve cold case crimes

By Kelly Hotard

With the massive popularity of crime shows such as “CSI” and “Law and Order” on television these days, the public now has a much greater awareness of and interest in the fascinating work forensic scientists do. What many people may not realize, however, is that crime-solving doesn’t just take place in police stations and crime labs – in fact, a group of six forensic anthropologists at LSU’s FACES Laboratory on campus work every day with investigators across the nation to solve these cases.

FACES, or Forensic Anthropology and Computer Enhancement Services, was created at the university in the 1990s, although forensic anthropology research had begun taking place at LSU a decade before, according to FACES Director Mary Manhein. In 2006, then-Gov. Kathleen Blanco signed a law that guaranteed funding for FACES, which has allowed the lab to hire a full staff of six forensic anthropologists and to create the Louisiana Repository for Unidentified and Missing Persons Information Program. Part of the program includes a database of personal information and DNA profiles gathered from unidentified persons cases around the state, many of which have gone unsolved for 20 to 30 years. The program also includes gathering DNA from family members of missing persons. All of these DNA profiles are uploaded into the national DNA database known as CODIS (or Combined DNA Index System) which can be searched for both kinds of matches.

“It’s very rewarding to be able to tell these families, ‘We’ve found your missing loved one,’” said Manhein. “We are able to send these people home and help in some small way to ease the family’s pain.”

The FACES Lab scientists have a variety of tools at their fingertips, from 3-D scanners and skull model printers to X-ray machines. Some of the technology is high tech, but Manhein wants people to know that, unlike what they see on television, everyday forensic labs are not nearly as elaborately equipped or specialized. In fact, the FACES Lab is an exception for forensic anthropology labs.



LSU's FACES lab is one of the best equipped forensic labs in the country, taking on approximately 50 new cases each year.

"People think every kind of forensic sciences lab has an expert in every area, and, in reality, that's just not the case," said Manhein. "Most forensic anthropology labs are small. Very few such labs have the setup we have, with six forensic anthropologists – that's an unprecedented number, except in one agency at the national level. We're really one of the best equipped forensic anthropology labs in the country."

At this time, the FACES database contains DNA from about 100 cases of unidentified persons in Louisiana and records on approximately 300+ missing persons from Louisiana and across the country. LSU's forensic anthropologists work on approximately 40 to 50 new cases every year. In addition to contributing the cases to CODIS, they also participate in other national databases.

Recently, Manhein, Ginesse Listi (Manhein's colleague), and a team of graduate students began working on another initiative: a database of stable isotope signatures for different regions in Louisiana, known as an isoscape. The process consists of taking bone samples from non-

domesticated animals, such as deer, from all across Louisiana and analyzing how much of certain stable isotopes, such as carbon, oxygen and strontium, are found in their bones. This isoscape will determine if the ratios of these elements are unique to specific areas in Louisiana and if those ratios can be distinguished from known isoscapes across the continent.

"Our hypothesis is that by comparing the amount of various isotopes within the human bones we find to the isoscape we will establish for Louisiana, we hope to be able to look at unidentified remains and tell if that person was born in Louisiana (through profiling the stable isotopes in his or her teeth since tooth enamel forms so early in life) and where the person lived most recently (through profiling the same isotopes in his or her bones which have a seven to ten-year turnover rate)," said Manhein. "It's just one more piece of the puzzle to solve these cases."

Manhein, who has more than 30 years of experience in forensic anthropology, conveys a clear enthusiasm for her work – a passion that she wants to share

with LSU students. She teaches graduate and undergraduate students of all backgrounds, from anthropology to pre-medical to general studies. Though many of her students are interested in a degree in anthropology, others are also interested in forensic science in general. Though LSU does not currently offer a degree in forensic science, Manhein said, students can still take a variety of courses at the university which will prepare them for working in the general field of forensic science, such as at the Louisiana State Police Crime Lab.

"I teach a 2000-level course, Introduction to Forensic Anthropology, that anyone can take, just for fun, regardless of major," said Manhein.

Manhein is also the author of several books on the subject, and her latest work, *Bone Remains: Cold Cases in Forensic Anthropology*, will be released in September 2013 by LSU Press.



For current and future sufferers of Parkinson's disease, the study of fine motor movement may be a key to unlocking earlier diagnosis and improved treatment regimens.

Time Matters

By Paige Brown

Parkinson's disease, a degenerative disorder of the central nervous system, affects about 1 percent over the age of 60 of the world population, or at least 1 million Americans. Parkinson's patients are typically diagnosed at an average age of 60 years old, while young-onset Parkinson's disease occurs in 5-10 percent of Parkinson's patients, who develop symptoms at 40 years of age or younger. Despite the widespread impact of the disease, no biomarker for Parkinson's currently exists, making diagnosis, especially early diagnosis, especially difficult. Proper diagnosis

requires that patients present two out of the three main symptoms of the disease: tremors at rest, slowness of movement and/or initiation of movement, and rigidity.

“By the time Parkinson's patients are normally diagnosed, nearly 80 percent of their normal dopamine levels are depleted,” said Arend Van Gemmert assistant professor in the School of Kinesiology and director of the Fine Motor Control and Learning Laboratory.

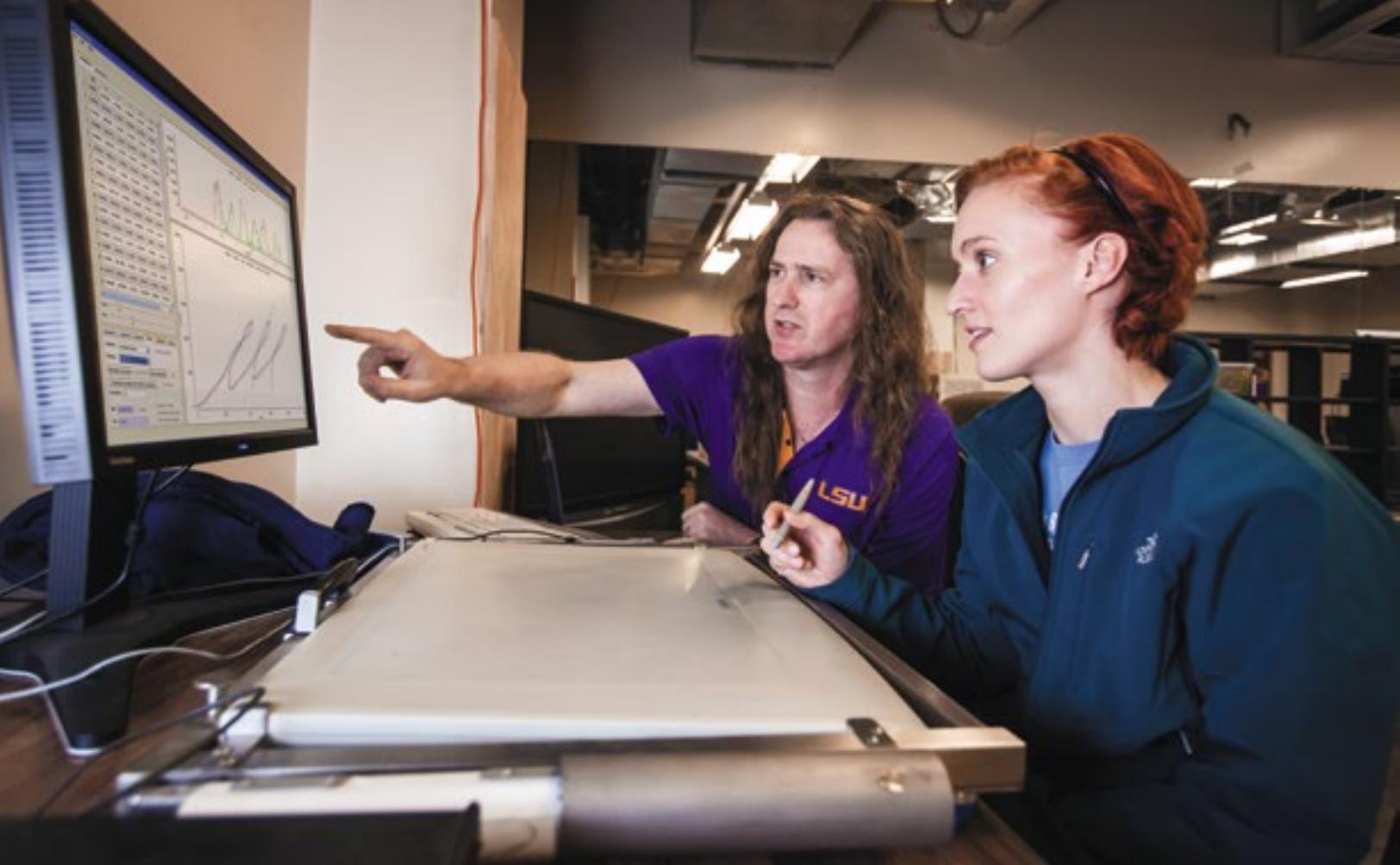
Parkinson's disease is characterized by abnormal death of cells in the substantia nigra, a region of the midbrain responsible for producing adequate levels of the neurotransmitter dopamine. Dopamine is a neurotransmitter that helps control the brain's reward and pleasure centers and regulates movement and emotional responses. Dopamine deficiency in Parkinson's patients causes the characteristic movement disorders observed in the disease. However, because large-scale movement deteriorations are not observed in Parkinson's patients until dopamine levels are substantially depleted, there is a push in research on the disease to develop techniques for earlier diagnosis.

Van Gemmert is hot on this trail, working to develop methods for the characterization of fine motor function changes in Parkinson's patients using handwriting. By investigating the fine motor movement changes associated with Parkinson's, as opposed to the typical large-scale movement disorders that affect patients in later stages of the disease, Van Gemmert and his team may be unlocking a method for earlier diagnosis and therapeutic evaluation.

“I am interested in fine motor function, in particular fine motor skills performed

with the hands,” Van Gemmert said. “My analysis of handwriting is not like what people normally think about when they hear analysis of handwriting – I am not looking at personality or other characteristics commonly associated with handwriting. I am using handwriting as a tool to investigate how fine motor function is affected by situations including stress, aging and movement disorders, in particular Parkinson's disease.”

Van Gemmert investigates how the fingers and wrist coordinate to produce fine movements, and how this coordination is affected by illnesses such as Parkinson's disease. He and his team use a computerized writing tablet and custom mathematical algorithms in order to extract information on accelerations and decelerations in an individual's handwriting, and use this information to estimate the forces required in writing.



LSU Assistant Professor of Kinesiology Arend Van Gemmert researches early impacts Parkinson's Disease may have on patients handwriting, working toward improved diagnosis methods.

“Handwriting is a communication skill that requires acceleration of the tip of the pen rapidly and accurately over the surface of the paper,” Van Gemmert and colleagues wrote in a related research paper. “An important feature of proficient handwriting is that acceleration needs to be accurately modulated to keep the writing legible.”

In his own research, Van Gemmert has found supporting evidence for changes in handwriting among Parkinson's patients when compared to people of similar ages without Parkinson's disease. Van Gemmert and other researchers have recognized micrographia, or abnormally small, cramped handwriting, as a symptom of the disease, where 10-15 percent of Parkinson's patients have been observed clinically to write progressively smaller than the average handwriting height of 0.8 centimeters. While only one other research group has shown evidence that micrographia occurs before a Parkinson's disease diagnosis can be typically be made, Van Gemmert has observed patients often claim that they noticed this symptom looking back after diagnosis.

“I am hoping we can use this technique in the future to help diagnose Parkinson's patients and to help determine appropriate doses of current therapeutics,” Van Gemmert said.

In his research, Van Gemmert has also shown that Parkinson's patients have trouble drawing big letters, especially when asked to write quickly. In handwriting analysis experiments, Van Gemmert and his team observed that when challenged to write letters of a particular size, Parkinson's patients have more trouble accomplishing the task than individuals of a similar age without Parkinson's disease. This is because Parkinson's patients have trouble producing the modulated forces required during the acceleration and deceleration phases of handwriting. As a result, they display “jerky” handwriting. Also, in trying to write smoothly in a laboratory setting, Parkinson's patients often write smaller and push harder on the pen.

“Handwriting is a very good model for fine motor movements,” Van Gemmert said. “I use handwriting-like movements to measure displacement and axial pen pressure. These measures can then be used to calculate velocity, acceleration and jerk. These measures and other derived measures can be used to infer coordination between the arm, wrist and fingers when performing a fine motor task. With our measurements, we can show if an individual writes faster or slower, with more or less pressure, and more or less smoothly than normal. These changes can occur due to stress, disease or the difficulty of the task.”

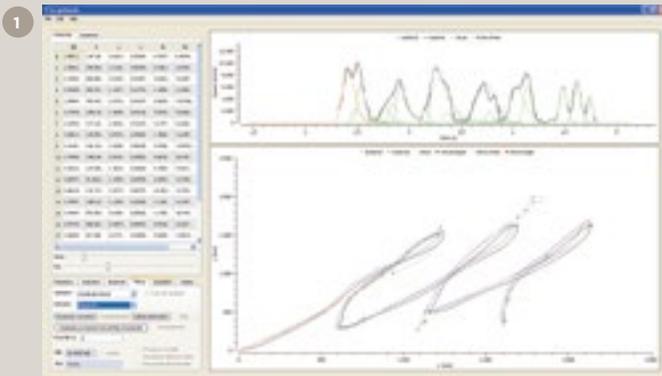
From maneuvering buttons on clothing to writing a check, disruptions in fine motor movements can affect Parkinson's patients early in the course of the disease. Van Gemmert hopes that handwriting analysis can become a go-to tool for helping diagnose Parkinson's disease and provide patients with adequate levels of dopaminergic therapeutics. However, he warns, handwriting analysis must be paired with other more traditional diagnostic tools in order to be effective in helping diagnose Parkinson's disease. Before micrographia can be evaluated as a clinical symptom of the disease, researchers must also show that smaller-than-average handwriting is not a side effect of other Parkinson-like nervous disorders.

Van Gemmert and his team also study bilateral transfer of learning in Parkinson's patients and how stress affects motor movement. Through his work on fine motor movement analysis, Van Gemmert is improving our ability to investigate how various illnesses affect movement centers of the brain.

"In 5-10 years, I hope that we can start having clinical trials using relatively inexpensive digitizer tablets or even iPads/PC tablets, improving the monitoring of treatment effectiveness and to help with the early diagnosis of probable Parkinson's disease," said Van Gemmert. "Also, I hope that my research, in general, increases our



knowledge about the involvement of basal ganglia in the planning and execution of fine motor skills. If we have a better understanding of this, maybe researchers will find better treatments to target the disease and/or to alleviate the disabling symptoms associated with Parkinson's."

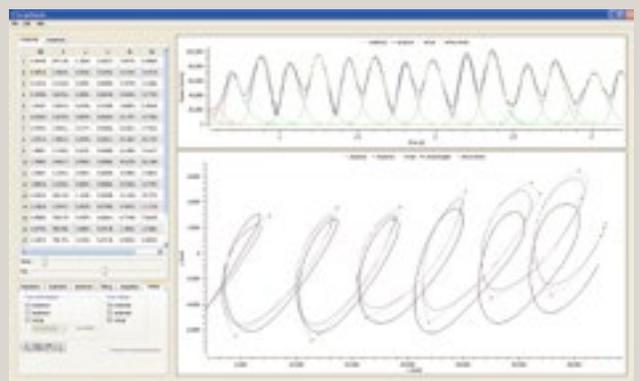
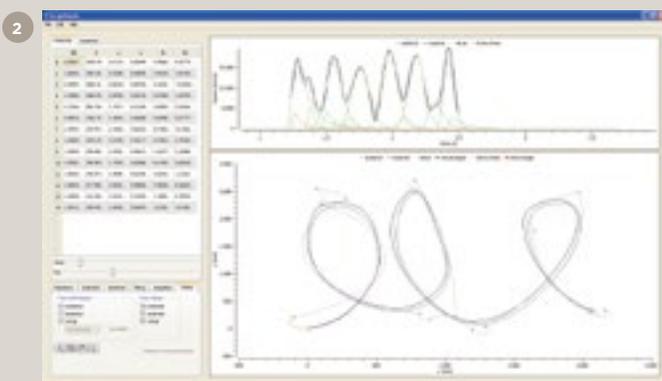


These screenshots are from the analysis program developed at the Polytechnique University Montreal in the lab of Réjean Plamondon, and researchers at LSU can use it because of a collaboration agreement between the two universities initiated by Plamondon and LSU's Arend Van Gemmert.

The first screenshot is of an individual with Parkinson's disease. Notice the number of green velocity impulses needed to make a single letter l. Also, the actual velocity does not show bell shaped profiles, so although the written traces do not look terrible, the fingers and wrist do not efficiently move the tip of the pen over the surface.

The second screenshot is of an older individual (over 60). Notice that the number of green velocity impulses are still high, but most of the velocity impulses are just small corrections (so they have small amplitudes). The dark blue profile shows much more bell shaped velocity profiles again indicating much more efficient use of the fingers and wrist to propel the pen over the surface.

The third screenshot is of a young adult. Notice that there are much less green impulse velocity profiles. Each dark blue velocity peak is built by just a single velocity impulse, so the tip of the pen is very efficiently moved by the fingers and wrist over the surface.



To celebrate success and acknowledge exceptional achievements in research and scholarship, LSU's Office of Research & Economic Development, or ORED, presents two faculty members with the Distinguished Research Master Award each year. At the same time, the LSU Alumni Association and the LSU Graduate School recognize two graduate students for excellence in their academic efforts with the Distinguished Dissertation Award.

LSU Distinguished Research Masters

Bradley E. Schaefer

Schaefer, a professor in LSU's Department of Physics & Astronomy, received his bachelor's degree and Ph.D. in physics from the Massachusetts Institute of Technology.

"I am very happy to have received the LSU Distinguished Research Master award, as it puts me into strong company," said Schaefer. "LSU has always been very supportive of my research, and it is a wonderful place. I have fun with trying to learn the secrets of the universe, and recently I had a good research idea for which two undergraduate students can tackle a new front-line astrophysics question, presumably leading to their own publication of research papers."

He has published more than 200 peer-reviewed articles in prestigious journals – eight in *Nature* alone. Schaefer also publishes in popular media, including *Sky & Telescope* and *Scientific American*, helping to spread the public understanding of astronomy and physics.

Schaefer's research has received international acclaim, most notably for his role in the Supernova Cosmology Project paper reporting the discovery of the accelerated expansion of the universe due to a previously unknown form of energy now known as dark energy, which is embedded in the fabric of space. The discovery received the 2011 Nobel Prize. Schaefer, a coauthor, was invited to the Nobel Prize Award ceremony in Stockholm, Sweden.

"Professor Schaefer is a first-rate scientist with a worldwide reputation," said Michael Cherry, chair of LSU's Department of Physics & Astronomy. "He brings credit to LSU and at the same time brings a sense of energy, enthusiasm and just plain fun to his students and his faculty colleagues. He heartily deserves this award."

Carl Freedman

Freedman, the James F. Cassidy Professor in the Department of English holds a faculty position in comparative literature and the program in film and media arts. He received his bachelor's degree in English from Oxford University and the University of North Carolina at Chapel Hill and his Ph.D. from Yale University.

"I am very grateful for all the support that LSU has offered me during the past three decades, support that has been essential to completing the work honored by the Distinguished Research Master award, said Freedman." I'm thinking, for instance, of the material support, the climate of academic freedom, and – certainly not least – all the excellent colleagues and students from whom I've learned so much. I only hope that LSU will be able to continue offering the same kind of support to young scholars that I received as a young scholar and afterwards."

Freedman has a prolific record of scholarship including books, articles and reviews – encompassing a broad range of topics from science fiction to crime movies to Nixon – all united through a lens of Marxist critical theory.

Freedman has been at LSU for 28 years. He currently serves on the Graduate Council – and he recently completed a three-year term as director of graduate studies in English. He has received numerous awards, including the 2008 LSU Distinguished Faculty Teaching Award and the Outstanding Graduate Faculty Award. Since becoming a tenured associate professor in 1989, he has directed almost 20 doctoral dissertations.

"He is intellectually gifted and absolutely committed to this work," said J. Gerald Kennedy, LSU Boyd Professor in English and Freedman's nominator. "He is moreover a wonderful colleague and a caring teacher. This seems just the right moment for LSU to acknowledge and celebrate the prodigious achievements of an extraordinary mind."



From left to right: former Interim Vice Chancellor of Research & Economic Development Thomas Klei; Distinguished Research Master recipients Bradley E. Schaefer and Carl Freedman; Distinguished Dissertation Award Recipients Adam Pratt and Sarah Caudill; and Dean of the Graduate School Gary Byerly.

Distinguished Dissertation Award Recipients

The LSU Alumni Association and the Graduate School sponsor the Distinguished Dissertation Awards, presented annually since 1983. The awards, handed down in two categories, are given to doctoral students whose research and writing demonstrate superior scholarship.

Josephine A. Roberts Alumni Association Distinguished Dissertation Award in Arts, Humanities & Social Sciences

Adam Jeffrey Pratt was born in Des Moines, Iowa, but grew up in Duluth, Ga. After receiving a Bachelor of Arts from Clemson University in 2004, he wrote a thesis “The Cavalier in the Mind of the South, 1876-1916” and received a Master of Arts from LSU in 2007. His thesis examined the self-image of southern men of the period — one of aristocratic chivalry, honor, bravery and fighting skills — and its post-Civil War evolution towards an egalitarian volunteerism.

Pratt’s dissertation explores the frontier violence between white settlers and Cherokees during the period 1820-1840. He draws from a remarkably diverse set of primary sources, addresses important issues related to the clash of differing societies and weaves a well-told story in the process. Pratt received the T. Harry Williams Dissertation Fellowship in his final year of study.

LSU Alumni Association Distinguished Dissertation Award in Science, Engineering & Technology

Sarah Caudill was born in Daytona Beach, Florida. She received a bachelor’s degree in physics from Stetson University in 2006, including her introduction to gravity waves during a Summer Undergraduate Research Program at Cal Tech. She would move to LSU and become a member of the international collaboration Laser Interferometer Gravitational-Wave Observatory, or LIGO.

Caudill’s dissertation developed several approaches for detecting gravity waves. Such waves are predicted to occur as a consequence of highly energetic cosmic events but are so weak at great distances that the waves have not yet been recognized. This project is one of the premier scientific programs funded by the National Science Foundation. Caudill’s work has resulted in more than 27 publications with coauthors on the LIGO team.

Rainmakers

“Since our inception, Campus Federal has been a staunch supporter of faculty excellence, and we can think of no better investment in the future of this university than the LSU Rainmakers,” said Ron Moreau, vice president of business development and community relations at Campus Federal Credit Union.

LSU and Campus Federal Credit Union Name 2012 Rainmakers

LSU’s Office of Research & Economic Development, with the support of Campus Federal Credit Union, recently honored the recipients of the annual Rainmaker Awards for Research and Creative Activity. Rainmakers are those faculty members who are nationally and internationally recognized for innovative research and creative scholarship, compete for external funding at the highest levels and attract and mentor exceptional graduate students. A reception for the 2012 Rainmakers was held in the spring at The Club at LSU Union Square.

The 2012 Rainmakers are as follows:

- ▶ **Prosanta Chakrabarty:** Department of Biological Sciences, College of Science; Technology, Engineering & Mathematics Emerging Scholar
- ▶ **Julia Buckner:** Department of Psychology; College of Humanities & Social Sciences; Arts, Humanities, Social or Behavioral Sciences Emerging Scholar
- ▶ **Rongying Jin:** Department of Physics & Astronomy, College of Science; Technology, Engineering & Mathematics Mid-Career Scholar
- ▶ **Ashok Mishra:** Department of Agricultural Economics & Agribusiness, College of Agriculture; Arts, Humanities, Social or Behavioral Sciences Mid-Career Scholar
- ▶ **Rudolf Hirschheim:** Department of Information Systems & Decision Sciences, E. J. Ourso College of Business; Arts, Humanities, Social or Behavioral Sciences Senior Scholar
- ▶ **Kam-biu Liu:** Department of Oceanography & Coastal Sciences, School of the Coast & Environment; Science, Technology, Engineering & Mathematics Senior Scholar

Emerging Scholars

Chakrabarty, assistant professor in the Department of Biological Sciences in LSU’s College of Science and curator of ichthyology in LSU’s Museum of Natural Science, and Buckner, assistant professor in the Department of Psychology in LSU’s College of Humanities & Social Sciences, have received the university’s Rainmaker’s Emerging Scholar Award in Science, Technology, Engineering and Mathematics, and Arts, Humanities, Social or Behavioral Sciences, respectively. Chakrabarty uses molecular and morphological phylogenetic techniques to better understand evolutionary processes in fish species. Buckner’s research focuses on explaining factors of anxiety disorders and substance use disorders and developing evaluation of treatment and prevention protocols for such disorders.

The Emerging Scholar Award recognizes junior faculty members exhibiting success at the assistant professor level as measured by significant contribution to the faculty member’s field of research or creative activity including publication in a high-impact journal(s); a highly cited piece of work; external awards; invited presentations at national and international meetings; high journal publication productivity; critically acclaimed book publication, performances or exhibits; or high grant productivity. Chakrabarty and Buckner will each receive a one-time stipend of \$1,000 and a plaque in recognition of their achievements.



From left to right, front row: Interim Vice Chancellor of Research & Economic Development Thomas Klei; Prosanta Chakrabarty, Department of Biological Sciences, Museum of Natural Science, College of Science; Kam-biu Liu, Department of Oceanography & Coastal Sciences, School of the Coast & Environment; Rongying Jin, Department of Physics & Astronomy, College of Science; Dawn Harris, Chief Operating Officer at Campus Federal Credit Union Back row: Kenneth Paxton, Campus Federal Credit Union Chairman of the Board; Rudolph Hirschheim, Department of Information Systems & Decision Sciences, E. J. Ourso College of Business; Ashok Mishra, Department of Agricultural Economics & Agribusiness, College of Agriculture; Julia Buckner, Department of Psychology, College of Humanities & Social Sciences.

Mid-Career Scholar

Jin, professor in the Department of Physics & Astronomy in LSU's College of Science, and Ashok Mishra, professor in the Department of Agricultural Economics & Agribusiness in the College of Agriculture, have received the Rainmakers Mid-Career Scholar Award in Science, Technology, Engineering and Mathematics, and Arts, Humanities, Social or Behavioral Sciences, respectively. Jin's research focuses on the development of novel complex materials with intriguing physical properties, and Mishra studies diverse topics in agricultural finance and policy.

This award recognizes faculty members at the associate professor or full professor level who exhibit a sustained program of excellence as measured by the criteria set forth in the emerging scholar category. Award winners in the Mid-Career Scholar category have been at LSU for 7-10 years. Jin and Mishra will receive a one-time stipend of \$1,000 and a plaque in recognition of their achievements.

Senior Scholars

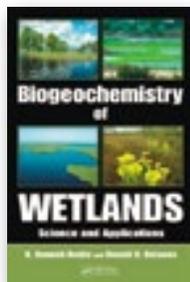
Hirschheim, Ourso Family Distinguished Professor of Information Systems in LSU's E. J. Ourso College of Business, and Kam-biu Liu, George W. Barineau III Professor of Oceanography and Coastal Sciences in LSU's School of the Coast & Environment, have received the

Rainmaker's Senior Scholar Award in Arts, Humanities and Social Sciences, and Science, Technology, Engineering and Mathematics, respectively. Hirschheim's research interests include outsourcing and management of information systems. Liu studies ancient hurricane and climate history throughout the U.S. Gulf and Atlantic coasts, the Caribbean region and Central America, South America, the Tibetan Plateau, Central Asia, China and Africa.

This is recognition for a faculty member whose work is comparable to the quality of that considered for the Distinguished Research Master award or Boyd Professor designation. This award is typically reserved for a faculty member who has been promoted to full professor and has exhibited a sustained program of excellence as measured by significant contributions to the faculty member's field of research or creative activity in the same previous criteria. Hirschheim and Liu will receive a one-time stipend of \$1,000 and a plaque.

"We congratulate this year's Rainmakers and thank them for their hard work, dedication and scholarly excellence," said Thomas Klei, former LSU interim vice chancellor of research & economic development. "We're proud to have the support of Campus Federal Credit Union and their tireless support of LSU research."

Media Shelf



The Biogeochemistry of Wetlands

Ronald D. DeLaune, LSU Research Professor of Oceanography & Coastal Sciences, and K. Ramesh Reddy

This book offers an in-depth look at the chemical and biological cycling of nutrients, trace elements and toxic organic compounds in wetland soil and water column as related to water quality, carbon sequestration and greenhouse gases. It details the electrochemistry, biochemical processes and transformation mechanisms for the elemental cycling of carbon, oxygen, nitrogen, phosphorus and sulfur. Additional chapters examine the fate and chemistry of heavy metals and toxic organic compounds in wetland environments. The authors emphasize the role of redox-pH conditions, organic matter, microbial-mediated processes that drive transformation in wetlands, plant responses and adaptation to wetland soil conditions. They also analyze how excess water, sediment water and atmospheric change relate to elemental biogeochemical cycling.



Dark Archive

Laura Mullen, the McElveen Professor of English

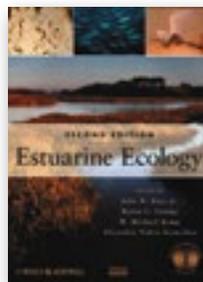
Mullen's fourth collection is a sequence of interrelated poems that explores how to accurately represent the reality of change and loss. Mullen pinpoints what is at stake: the possibility of communication and connection—and the hope of intimacy. Poetic tropes are measured against natural phenomena as Mullen examines what “witness” might mean in the context of the aftermath of Hurricane Katrina, the failures of capitalism to effect social justice, the murder of James Byrd in Texas, the personal loss of a mother figure and a disintegrating love affair.



Workplace Culture in Academic Libraries: The Early 21st Century

Kelly Blessinger and Paul Hrycaj, LSU Libraries Associate Librarians (Editors)

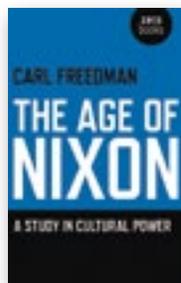
This book focuses on various aspects of workplace culture in academic libraries from the practitioners' viewpoint, as opposed to that of the theoretician. The book asks the following questions: What conditions contribute to an excellent academic library work environment? What helps to make a particular academic library a great place to work? Articles focus on actual programs while placing the discussion in a scholarly context.



Estuarine Ecology, Second Edition

LSU Professor Emeritus of Oceanography & Coastal Sciences John W. Day (Editor), W. Michael Kemp (Editor), Alejandro Yáñez-Arancibia (Editor), Byron C. Crump (Editor)

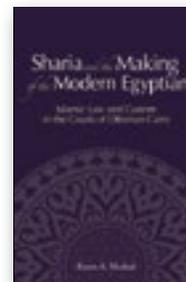
Estuaries are among the most biologically productive ecosystems on the planet—critical to the life cycles of fish, other aquatic animals, and the creatures which feed on them. This book covers the physical and chemical aspects of estuaries, the biology and ecology of key organisms, the flow of organic matter through estuaries and human interactions, such as the environmental impact of fisheries on estuaries and the effects of global climate change on these important ecosystems.



The Age of Nixon: A Study in Cultural Power

Carl Freedman, the James F. Cassidy Professor of English

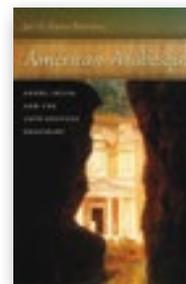
Freedman looks at not only the political history and political biography of Richard Nixon, but the profound psychic connection he had with the American people. The book is a study of cultural power—the ways that culture shapes our politics and frames our sense of possibilities and values.



Sharia and the Making of the Modern Egyptian: Islamic Law and Custom in the Courts of Ottoman Cairo

Reem Meshal, Assistant Professor of Philosophy and Religious Studies

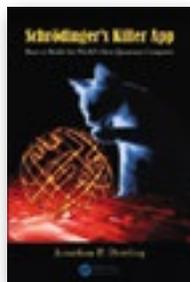
Meshal examines sijills, the official documents of the Ottoman Islamic courts, to understand how sharia law, society and the early-modern economy of 16th and 17th century Ottoman Cairo related to the practice of custom in determining rulings. In the 16th century, a new legal and cultural orthodoxy fostered the development of an early-modern Islam that broke new ground, giving rise to a new concept of the citizen and his role.



American Arabesque: Arabs and Islam in the 19th Century Imaginary

Jacob Berman, Assistant Professor of English.

Berman examines representations of Arabs, Islam and the Near East in 19th century American culture, arguing that these representations play a significant role in the development of American national identity over the century, revealing largely unexplored exchanges between these two cultural traditions that will alter how we understand them today.

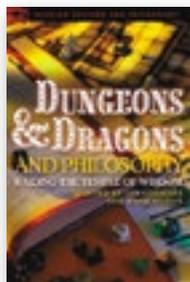


Schrödinger's Killer App: Race to Build the World's First Quantum Computer

Jonathon P. Dowling, Hearne Chair of Theoretical Physics

Dowling presents an inside look at the government's quest to build a quantum computer capable of solving complex mathematical problems and hacking the public-key encryption codes used to secure the Internet. The "killer application" refers to Shor's quantum factoring algorithm, which would unveil the encrypted communications of the entire Internet if a quantum computer could be built to run the algorithm. Schrödinger's notion of quantum entanglement—and his infamous cat—is at the heart of it all.

The book develops the concept of entanglement in the historical context of Einstein's 30-year battle with the physics community over the true meaning of quantum theory. It discusses the remedy to the threat posed by the quantum code breaker: quantum cryptography, which is unbreakable even by the quantum computer.

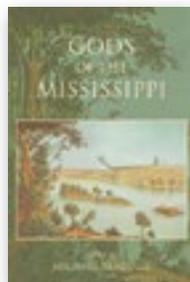


Dungeons & Dragons and Philosophy: Raiding the Temple of Wisdom

John Cogburn, Associate Professor of Philosophy and Religious Studies (Editor)

This volume will convince readers that the swift ascent of the tabletop role-playing game Dungeons & Dragons to worldwide popularity in the 1970s and 1980s is "the most exciting event in popular culture since the invention of the motion picture."

Dungeons & Dragons and Philosophy presents 21 chapters by different writers, all D&D aficionados but with starkly different insights and points of view. It will be appreciated by thoughtful fans of the game, including both those in their thirties, forties and fifties who have rediscovered the pastime they loved as teenagers and the new teenage and college-student D&D players who have grown up with gaming via computer and console games and are now turning to D&D as a richer, fuller gaming experience.

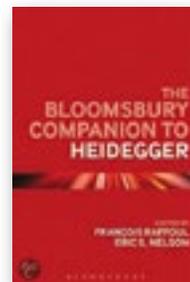


Gods of the Mississippi

Michael Pasquier, Assistant Professor of Philosophy and Religious Studies

From the colonial period to the present, the Mississippi River has impacted religious communities from Minnesota to the Gulf of Mexico. Exploring the religious landscape along the 2,530 miles of the largest river system in North America, the essays in Gods of the Mississippi make a compelling case for American religion in motion—not just from east to west, but also from north to south.

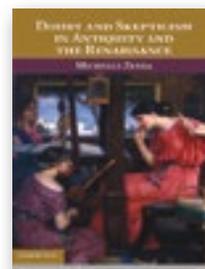
With discussion of topics such as the religions of the Black Atlantic, religion and empire, antebellum religious movements, the Mormons at Nauvoo, black religion in the delta, Catholicism in the Deep South, and Johnny Cash and religion, this volume contributes to a richer understanding of this diverse, dynamic and fluid religious world.



The Bloomsbury Companion to Heidegger

François Raffoul, Professor of Philosophy and Religious Studies

The Bloomsbury Companion to Heidegger is the definitive reference guide to the life of Martin Heidegger—one of the 20th century's most important philosophers. Presenting 58 original essays written by an international team of leading Heidegger scholars. The volume includes comprehensive coverage of Heidegger's life and contexts, sources, influences and encounters, key writings, major themes and topics, and reception and influence. This is the ideal research tool for anyone studying or working in the field of Heidegger Studies today.



Doubt and Skepticism in Antiquity and the Renaissance

Michelle Zerba, Professor of English

This book is an interdisciplinary study of the forms and uses of doubt in works by Homer, Sophocles, Aristophanes, Cicero, Machiavelli, Shakespeare, and Montaigne. Based on close analysis of literary and philosophical texts by these important authors, Zerba argues that doubt is a defining experience in antiquity and the Renaissance, one that constantly challenges the limits of thought and representation.

LSU professor and cellist Dennis Parker is publishing two volumes of the Violin Concerto (K 219) and the Sinfonia Concertante (K 364) by Mozart transcribed for cello.

They will be the first published and available works for cello as a solo instrument by Mozart.



LSU Science Café

LSU hosts a monthly Science Café series, held on the last Tuesday of each month in the side room of Chelsea's Café in Baton Rouge. Sponsored by the Office of Research & Economic Development, this event provides an opportunity for the public to come face-to-face with LSU research in a casual, informal environment geared toward a lay audience.

The Science Café series is open to the public and children are welcome to attend. Previous speakers include ichthyologist Prosanta Chakrabarty, who recounted adventures in Madagascar resulting in the discovery of a new species of fish; criminologist and ORED Senior Associate Vice Chancellor Matthew Lee discussed hip hop, heavy metal and homicide rates; and Joel Tohline, director of LSU's Center for Computation & Technology, discussed the rhythm of stars that cannibalize then explode; among many others.

Please join us for the next LSU Science Café! Doors open at 5 p.m. for food, networking and giveaways, and the talk starts at 6 p.m. For more information, call 225-578-3870.

Keep up-to-date with LSU Research. Visit lsu.edu/researchnews or follow @lsuresearchnews on Twitter

