



COLLEGE OF
Letters & Science
UNIVERSITY OF WISCONSIN-MADISON

The Liberal Arts Advantage

Annual Report, 2014-15

From the beginning,

FORWARD





SARAH MORTON

“No less than my brothers and sisters in arms, my colleagues at the University of Wisconsin are ‘the best and the brightest’ who really could have been whatever they wanted to be and chose a life of public service in education.”

— John W. Hall
Ambrose-Hesseltine Professor
of U.S. Military History;
Lt. Colonel, U.S. Army Reserve

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COLLEGE OF
Letters & Science
UNIVERSITY OF WISCONSIN-MADISON

The Liberal Arts Advantage

COLLEGE OF LETTERS & SCIENCE ANNUAL REPORT, 2014–2015

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The Liberal Arts Advantage welcomes readers' comments and story ideas for future issues.

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ON THE COVER

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4 FROM THE BEGINNING, FOR THE NEXT 167 YEARS

The earliest leaders of the College of Letters & Science instilled a commitment to the pursuit of excellence. Today, we continue that quest, with groundbreaking research on some of our universe's greatest mysteries.

18 OUR YEAR IN REVIEW

The past academic year was marked with top awards and honors, major milestones, and celebrations of our faculty, staff and students.

20 PREPARING STUDENTS FOR SUCCESS IN LIFE & WORK

Through efforts like the new Letters & Science Career Initiative, and innovative courses and classroom experiences, we are committed to preparing our students to make a good living and lead a good life.

24 SUPPORTING OUTSTANDING STUDENTS

Scholarships and generous gifts from alumni and friends give ambitious and inquisitive students the opportunity to pursue their passions across the liberal arts.

30 ADVANCING RESEARCH & KNOWLEDGE

Our faculty members push the boundaries of knowledge and pursue courses of study that address critical questions in highly-specialized fields.

36 L&S AND THE WISCONSIN IDEA

We work to improve the lives of people across the state and the world. Through research, scholarship and outstanding new facilities, we seek to engage a curious public.

40 BY THE NUMBERS



COLLEGE OF
Letters & Science
UNIVERSITY OF WISCONSIN-MADISON

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Storied **PAST** — bright **FUTURE**

Let me take you back to a shining moment nearly 167 years ago. In 1849, UW-Madison opened its doors to the people of Wisconsin, inviting not just the elite, but children of more modest means like farmers, pioneers, and immigrants, to study the ancient classics, mathematics, literature, and a handful of other subjects. There were 17 students and six departments.

Today, our university includes 21 schools and colleges spanning a vast range of disciplines, from agriculture to veterinary medicine. The largest of these is the College of Letters & Science.

It's often said that L&S, with its liberal arts offerings in languages, literature, writing, philosophy, mathematics, biological and physical sciences, social sciences, music and more, provides the well-rounded education that the university's founders envisioned.

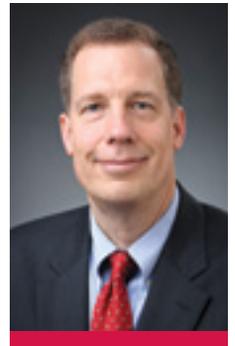
But today, the College of Letters & Science is so much more. Our scholars bring in more than \$125 million in research grant awards, resulting in breakthroughs in disease studies, insights about the origins of the universe, innovations in technology, and new ways to think about ourselves, our history and the policies that address the

greatest challenges of our age. We teach 83 percent of the credits for first- and second-year

students. Many of our departments are among the finest in the world, earning national and international rankings. And our undergraduates have won some of the most prestigious awards in the world, including Marshall, Churchill, Truman and Rhodes scholarships.

A world-class L&S is critical to the university's global standing as a research and teaching powerhouse. It is no exaggeration to say that L&S is, and will continue to be, the heart of our great university.

But we need continued support from generous alumni, friends, and parents like you to keep the



BRYCE RICHTER



College of Letters & Science — and UW-Madison as a whole — strong.

This fall, we are embarking on a comprehensive fundraising campaign to ensure UW-Madison remains one of the nation's best, internationally-recognized public institutions. I encourage all alumni and friends to invest in L&S or a favorite department in the college, and by so doing, support our tremendous faculty, staff and students.

Your commitment can help us:

- ▶ Hire and retain the very best teachers and researchers
- ▶ Prepare undergraduates for life and work through the new L&S Career Initiative
- ▶ Support life-changing research in the biological, physical, and mathematical sciences, the social sciences, and the arts and humanities
- ▶ Refurbish classrooms and laboratories to educate promising young minds
- ▶ Award scholarships to deserving students

Your gift of any amount is critical to our pursuit of excellence.

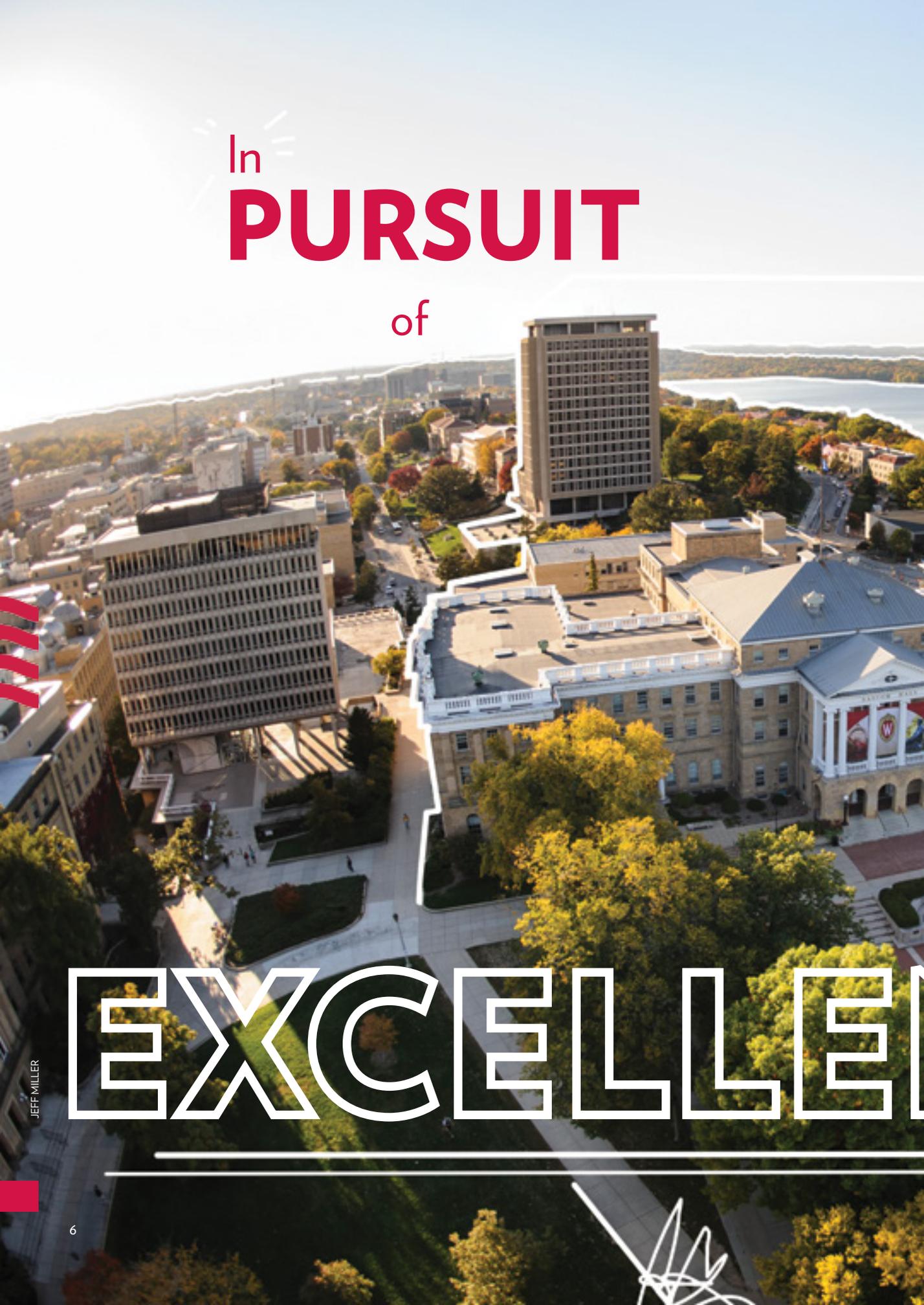
I invite you to discover more: Our annual report features stories and highlights from the 2014-2015 year, including a special section about our 167-year pursuit of excellence. These stories showcase some of the activities that make us proud of our faculty, staff and students. I hope you are inspired, as I am, by the great work that they do.

And as always, thank you for all that you do for the College of Letters & Science and the university.

On, Wisconsin!

John Karl Scholz
Dean and Nellie June Gray Professor of Economics

To learn more about how you can support the College of Letters & Science, visit: supportuw.org/giveto/lc



In
PURSUIT
of

EXCELLENCE

Back when timber wolves still roamed Madison's forested isthmus, a liberal arts tradition was taking shape at the University of Wisconsin.

The first students (there were 17 enrolled in the inaugural freshman class in 1849) focused primarily on ancient Latin and Greek, just as students did at Harvard and Yale.

But in addition to these "time-honored disciplines," Wisconsin upperclassmen could also choose courses in chemistry, international law, and political economy. Back East, many believed courses like these were too "practical" and "modern" for a college curriculum.

Here at Wisconsin, a different plan was unfolding.

"We are about laying the foundations of an Institution of learning, which we believe is destined to exert a great and salutary influence on the moral, intellectual, and social character of the people of this State, for all time to come," declared Eleazer Root, president of the first Board of Regents, as he greeted the first chancellor, John Lathrop, in 1849.

"All the people of the state" didn't just mean the elite. It meant the sons of farmers, pioneers, and immigrants, too. Many of them would enroll to become teachers. Leaders wanted these students enriched by courses in classics, philosophy, science, math, and modern languages such as French, German and Norwegian, so that they might "go forth with minds enlarged by a liberal course of study," while also being prepared for a job.

From the beginning, university leaders were drawn to the idea that the liberal arts would enrich everything — that specialists in trades or professions would benefit from studying philosophy, languages, literature, and mathematics. This general leaning eventually hardened into a bedrock value that would shape the university over the next 167 years. >>

NCE



Clockwise from top left: Washburn Observatory, ca. 1880-1930; Frederick Jackson Turner's classroom, ca. 1893-4; Bascom Hill, ca. 1919; Bascom Hall, with its dome still intact, ca. 1900; North Hall, the oldest building on campus, ca. 1885. (Images courtesy of the UW-Madison Archives)

Laying a firm foundation

Today the College of Letters & Science is the largest school on campus, graduating more than 3,000 students each year and teaching 58 percent of all the credits offered at UW-Madison.

It's the heart of this great university, grounding every student's experience in "a liberal course of study," just as the founders intended when they scrawled the university's charter with a quill pen, more than 167 years ago.

From just 34 professors at its beginning, L&S now houses hundreds: neurobiologists, philosophers, economists, musicians, and chemists. Filmmakers, writers, language specialists, and astrophysicists. Geologists, anthropologists, historians, psychologists — all pushing the boundaries of research and helping to change the world.

Dean John Karl Scholz describes the College of Letters & Science today as "the college of discovery, imagination and expression."

It is wonderful to behold, and difficult to define.

The founders may not have dreamed of its present-day complexity, or its momentous contributions to society and the world, but if their ghosts could wander through its labs and lecture halls, or take their (ghostly) seats in its classrooms

and colloquia, they'd easily discern the outline of their early vision for a "secular, state-supported, and state-managed institution in which any qualified youth might equip himself for a richer life."

"In reality, the College of Letters & Science [is] the original University of Wisconsin, dating back to the University's opening. It has retained to the present day those elements of the classical curriculum that formed the University's original academic program," wrote L&S Dean David Cronon in 1989.

True. But while today's classics students still read Homer, they might also travel to real-life Troy to help perform biochemical research on artifacts that shed further light on the people and customs immortalized in the *Iliad*.

And while French, German, and Norwegian programs are still strong, students can also delve into Arabic, Swahili, Pashto, Portuguese, Russian, Mandarin and 63 other languages.

Astronomy students may still marvel at the night sky at Washburn Observatory (which helped put UW-Madison on the map as a scientific research powerhouse in 1878), but they will learn even more about the universe from IceCube, the world's largest neutrino observatory buried deep in Antarctica.

New disciplines, new teaching methods, new research questions, and new discoveries in the College

of Letters & Science have evolved from the earliest traditions of academic excellence and intellectual freedom at UW-Madison.

Setting a bold course

The 1862 Morrill Land Grant Act played a defining role in the Wisconsin liberal arts tradition. Money from the federal government was on the table. Would Wisconsin use it to build a separate agricultural and technical college, as did Iowa, Ohio, Michigan, and other Midwestern states? Or would it combine its strengths, creating one massive university with a free exchange of knowledge between the applied sciences and the arts and letters curriculum?

A farmer from Columbia County introduced the bill that helped Wisconsin legislators make history, and laid the groundwork for the highly successful model of learning, teaching and research we know today. Instead of two universities, one great one was established in 1866 under the bill.

“Wisconsin’s acceptance of the Federal land grant ... strengthened the University’s position as a center for the liberal arts,” wrote historian John Frank Cook in *A History of Liberal Education at UW-Madison*.

As the university grew, so did L&S. Size brought strength.

“A lot of liberal arts colleges attract students and faculty by discussing their close community

and claiming that ‘small is beautiful,’” Chancellor Rebecca Blank said in her State of the University address in fall 2014. “Well, I want to announce that I’m firmly committed to the idea that, when it comes to education and research, ‘bigger is better.’”

Pioneers of scholarship

Because the state made that critical choice in the land-grant era — to build on UW’s original liberal arts curriculum, rather than establish a separate university for agriculture — the opportunities for a deep yet broad education were greatly expanded. Highly-skilled faculty became interested in working here. Professors trained in eastern schools came west to Wisconsin, and found room to explore new ideas. Many of them introduced programs of study that broke boundaries and redefined the term “liberal education.”

Physicist John E. Davis, astronomer James C. Watson, and geologist Roland D. Irving all helped the newly-formed College of Letters & Science become a center of scientific investigation by the end of the 19th century “that could not be overlooked.”

The humanities were growing, too. The classics and the languages surged between 1889 to 1903, as the number of philosophy courses doubled; 25 new courses were added in Greek and 12 more in Latin; the French program increased its

The School of Athens, a fresco by Raffaello Sanzio da Urbino, in the Apostolic Palace in Vatican City. The fresco features philosophers Plato and Aristotle as its central figures. (Image curated in the public domain)



Why is it called the “liberal arts?”

The term “liberal arts” does not refer to contemporary political views. Rather, it harks back to the philosopher Plato. In his enduring treatise, *The Republic*, Plato outlined seven “artes” considered essential for a free-thinking person: grammar, logic, rhetoric, arithmetic, geometry, music, and astronomy.

Over the centuries, the scope of a “liberal arts education” widened to include many more disciplines, but it is still understood to offer a breadth and depth of instruction “worthy of a free person,” which is the Latin definition of the word “liberal.”



From left: Central campus, 1907; Helen C. White, ca. 1920; George Mosse, ca. 1950-59; Jan Vansina, 1986; Sau Lan Wu, 2008; the “Sifting and Winnowing” plaque on Bascom Hall. (Images courtesy of the UW-Madison Archives, and Jeff Miller, University of Wisconsin-Madison)

course offerings from five to 38, and the German department cemented its reputation as one of the strongest and best in the country.

L&S attracted curious, innovative thinkers like Frederick Jackson Turner, who wrote and taught about the significance of the frontier in American history, and Richard T. Ely, an outstanding young economist whose hiring opened a new chapter in the study of the social sciences.

In fact, it was Ely’s teaching of “controversial subjects” such as strikes, boycotts and socialism that led to the UW Board of Regents issuing the famous “sifting and winnowing” statement in 1894, that has come to define academic freedom at UW-Madison.

And it was in L&S where the “Wisconsin Idea” took root, when history scholar Charles McCarthy proposed that University of Wisconsin expertise could and should be shared to benefit the lives of state citizens.

Great people

It was people who elevated this college and made it great. People like the first dean of L&S, Edward A. Birge, who for 27 years, guided the college through transformation and change but always championed the liberal arts’ role in preparing students for life. He spoke of L&S providing “a corps of intelligent citizens” able to offer society the wisdom of past generations, to be used to solve present and future problems.

People like English Professor Helen C. White, the first woman to earn the rank of full professor in L&S in 1936, who eloquently defended literature’s place in society: “In times of war, cold or hot, nerves tauten, and minds harden, and hearts grow cold. We need literature to remind us that men with whom we could never agree are yet men, that something of us is defiled in their evil, and even though we triumph, something of us is buried in their destruction. Literature keeps these things alive for us.”

People like historian George L. Mosse, who escaped Nazi persecution and came to UW-Madison to teach European intellectual history and Jewish history. His colleagues called him “fearless in exploring difficult subjects.”

People like anthropologist and historian Jan Vansina, who reached thousands of years into the past to reclaim the “unknowable” history of Africa through oral storytelling. Vansina founded the African Studies program here in the 1950s, and then turned his attention to war-torn Rwanda in the 1970s, saying, “I felt that knowledge of Rwanda’s pre-colonial history could contribute to political courses about its future.” Vansina’s legacy extends beyond academia: he worked with journalist Alex Haley to trace his African origins, an endeavor that led to Haley’s blockbuster novel and mini-series, *Roots*.



So many more faculty, staff, graduate students, undergraduates, and alumni — the best and brightest from Wisconsin and beyond — shaped L&S into a dynamo of teaching, research and service that powers the university through 38 departments and five professional schools. And it is the respect for academic freedom, the responsibility to educate the sons and daughters of Wisconsin families and the support for blue skies research that fuels the astounding discoveries and advancements happening in L&S today.

From Sau Lan Wu’s physics team that helped discover evidence of the Higgs boson, to the Institute for Research on Poverty and the Institute for Research in the Humanities, faculty and students in the College of Letters & Science push beyond the boundaries of what we know. They share this excitement in the classroom, in the lab, in the field, and throughout our communities.

The past informs the present

Making connections between past and present reminds us how strong leadership, a bold course, and a commitment to bedrock values have guided L&S through more than a century of growth and change — some of it turbulent. We look back, in order to look forward with clarity and steadfastness.

For example, Dean Birge’s early conviction that “a public university should not only transmit, but increase, man’s fund of knowledge” has evolved

into a direct mandate for groundbreaking research in all fields, from science to the humanities to the social sciences. It has fueled the quest to know, and discover, that characterizes UW-Madison today.

The first Regents’ insistence on a more practical intellectual tradition can be seen today in the new Letters & Science Career Initiative, launched by Dean Scholz to provide liberal arts students with a blueprint for planning and launching their working lives.

President Thomas Chamberlin’s bold resolve, in the late 1800s, to seek nationwide for the very best professors to teach the brightest students — and keep them here — continues today, as leaders seek support to hire and retain key faculty.

And those first 17 students who, in 1849, huddled near the fire to study the ancient classics? They’re not so different than the thousands of new L&S undergraduate and graduate students arriving this fall. Bright, determined, and eager to explore new frontiers, L&S students are a special breed. They are leaders committed to making the world a better place. And beyond all else, we are committed to their success. ■

Below: Edward A. Birge, first dean of Letters & Science and one of the pioneers of limnology in the United States. (Image courtesy of the UW-Madison Archives)



On, Wisconsin!

A SHOT in the DARK

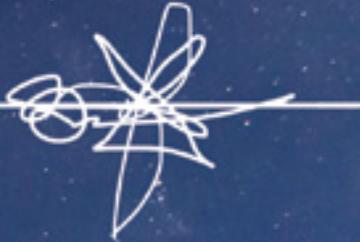
Deep in the Antarctic ice, all is seemingly calm.

Yet particles — tiny, subatomic particles — are whizzing by at an astonishing speed. And when the intergalactic guest of honor finally arrives, chaos ensues.

A violent collision sends millions more particles flying.

It's a moment of scientific discovery — happening in a flash — and University of Wisconsin-Madison researchers are watching. And each of these moments, each time the scientists spot a mysterious neutrino from the cosmos, it gives them more data, more clues in their quest to better understand our universe.





The term “neutrino” might sound straight out of science fiction — there are numerous references across the *Star Trek* universe, not to mention in *Ghostbusters* and *Doctor Who* — but the nearly massless subatomic particles are allowing physicists in the College of Letters & Science to look at the sky like never before ... even if more questions than answers are staring back at them.

UW-Madison has become one of the world’s top spots to study particle astrophysics, a field that, as its name suggests, is at the intersection of particle physics and astronomy.

The driving force is the IceCube Neutrino Observatory, a first-of-its-kind particle detector that’s buried in a cubic kilometer of Antarctic ice and run by an international collaboration led by UW-Madison. IceCube has already discovered the first evidence for cosmic, high-energy neutrinos coming from outside our solar system and it may help scientists pursue even greater astrophysical mysteries.

Francis Halzen, the Hillebrand and Gregory Breit Distinguished Professor of Physics, is the principal investigator of IceCube and one of five UW-Madison physics professors involved in the collaboration. The Belgian physicist has dedicated the majority of his career to hunting neutrinos, a pursuit that’s sent members of his research collaboration to — literally — the ends of the Earth. >>

The IceCube Laboratory at the Amundsen-Scott South Pole station in Antarctica, under the stars. (Felipe Pedreros, IceCube/NSF)



Clockwise from top left: Francis Halzen, Hilldale and Gregory Breit Distinguished Professor of Physics and principal investigator of the IceCube project; Kael Hanson, professor of physics and director of the Wisconsin IceCube Particle Astrophysics Center; Albrecht Karle, professor of physics and principal investigator of the Askaryan Radio Array.

In November 2013, the international IceCube Collaboration published landmark cosmic neutrino results — a feat that won a Breakthrough of the Year award from *Physics World* magazine and landed Halzen a 2014 American Ingenuity Award from *Smithsonian* magazine.

The discovery represented one of the most significant steps in the quest to answer some of the so-called ghost particle’s riddles. In presenting Halzen’s *Smithsonian* award, famed astrophysicist Stephen Hawking characterized the breakthrough as a “transformational moment” in the mission to better understand our universe.

This is basic research in its purest form, seeking to expand our fundamental knowledge of the cosmos. It’s also uncharted scientific territory. The information neutrinos hold remains a mystery.

“We’ll find out, right?” Halzen says with a grin.

What, exactly, is a neutrino?

Neutrinos are subatomic particles, like the more familiar protons, neutrons and electrons. But while protons and neutrons are composite particles, meaning they’re made up of other smaller particles, neutrinos (and electrons) are elementary particles — the smallest unit of particle, as far as we know.

Unlike electrons, though, neutrinos hold no electric charge, which is the reason they’re so darn difficult to spot. Billions pass through the Earth

each second, unbeknownst to us, since they so seldom interact with matter (hence, the “ghost particle” moniker).

Wolfgang Pauli, an Austrian-Swiss theoretical physicist, first suggested the existence of the neutrino in 1930. But it wasn’t until 1956 that American physicists Clyde Cowan and Frederick Reines detected neutrinos at a nuclear reactor in South Carolina using tanks of water and a compound called cadmium chloride. Since then, scientists have studied neutrinos with particle accelerators and aluminum plates, Olympic-sized swimming pools, and other gargantuan setups around the world.

Halzen began contemplating neutrinos as a young professor in the 1970s by working on a theory for a method to detect them in ice, based on an idea put forward by Soviet scientists a decade earlier. A few years later, he began building a research collaboration and, suddenly, a theoretical physicist who had never run a major experiment was on his way to leading the world’s largest particle detector.

How to find them

What sets IceCube apart is its ability to detect high-energy neutrinos — the kind that come from violent, powerful cosmic events (as opposed to other neutrino sources, such as the sun).

Halzen and his colleagues are chasing neutrinos from black holes at the centers of galaxies, gamma ray bursts, supernovas, regions of

IceCube's neutrinos have come from all across the sky. Francis Halzen compares the process to creating a digital image of the cosmos — in essence, instead of seeing the sky in light beams, IceCube sees it in neutrinos.

“We don't have enough pixels yet to make an image,” Halzen says.

“Each neutrino is a pixel.”

intense star formation and pulsars. Now, the *Star Trek* references don't seem so out of place.

“Neutrinos are really sort of the last stand, really the only known particle that we can use to reach out and look at the sky at extreme energies,” says Kael Hanson, a professor of physics and the director of the Wisconsin IceCube Particle Astrophysics Center (WIPAC), the organizational container for IceCube.

So how does IceCube snag these rare high-energy neutrinos?

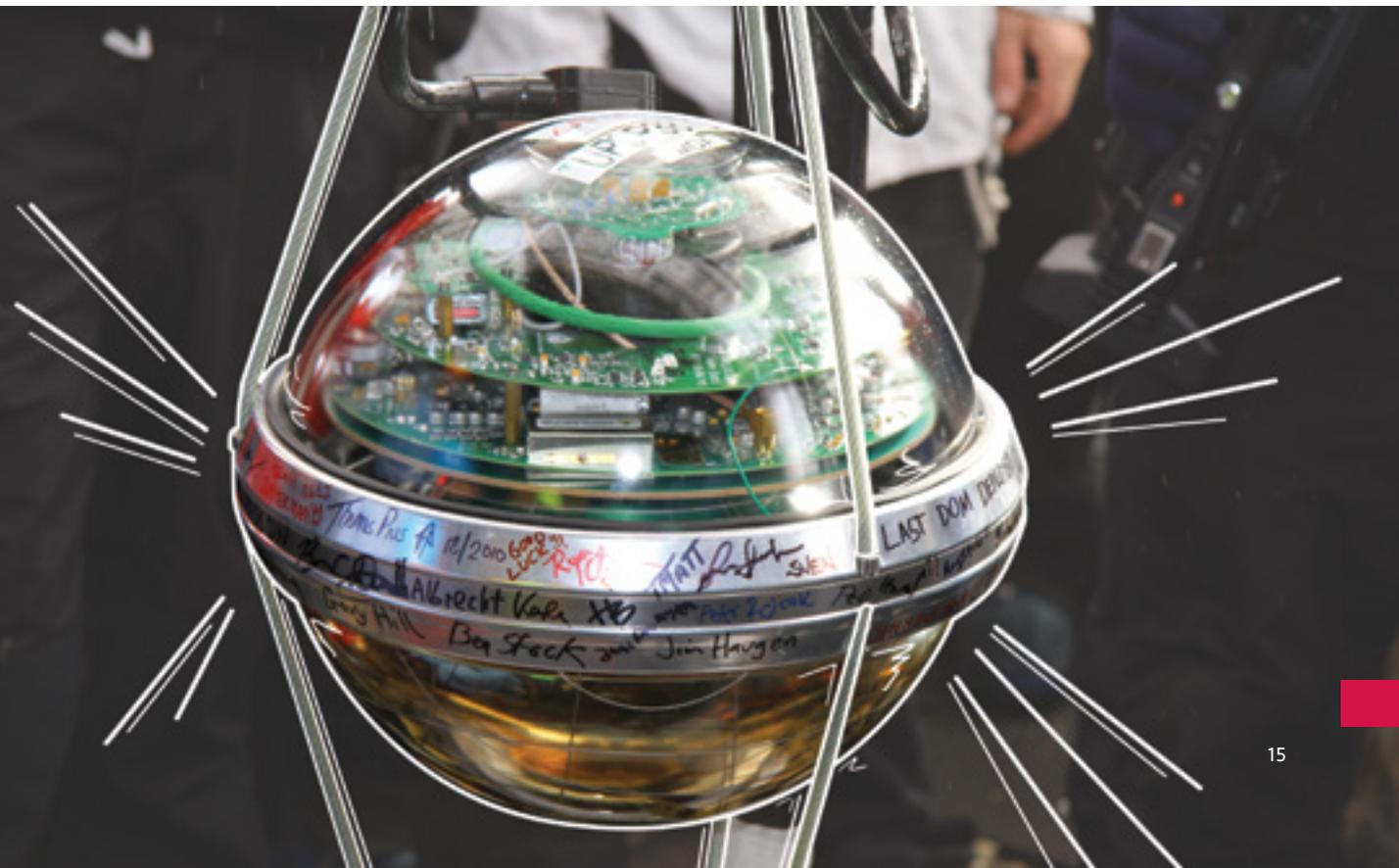
For starters, it's all about location. The Antarctic ice is extremely clear and abundant — IceCube covers 1 billion tons of ice — and, at the detector's

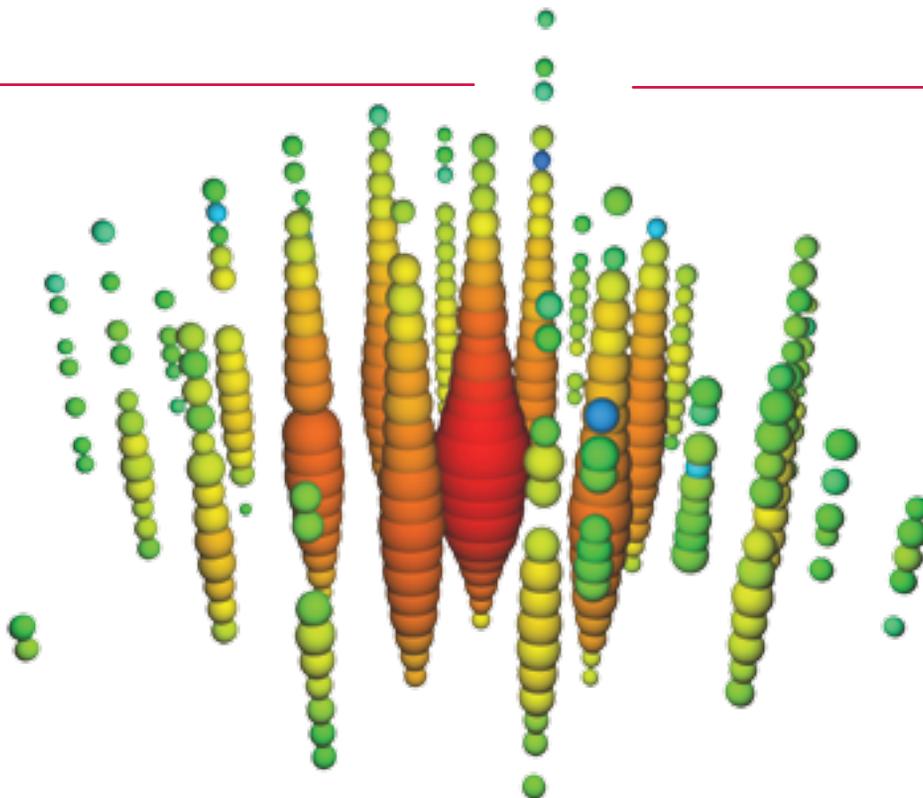
depth of 1 to 1.5 miles, it's partially sheltered from the constant bombardment of cosmic rays that pummel Earth's atmosphere, showering particles everywhere.

It's also nice and dark. That's important, because when neutrinos travel through the ice, they sometimes — extremely infrequently — slam into a proton or neutron from a water molecule, producing a tiny blue light called Cherenkov light.

IceCube captures that light using 5,160 digital optical modules (DOMs) — sensors the size of basketballs that are encased in glass and suspended on 86 cables that send information about each collision to the surface.

The last of IceCube's 5,160 digital optical modules, with signatures from scientists from UW-Madison and around the world, before it is deployed in the Antarctic ice. (Photo courtesy of IceCube/NSF)





This is how IceCube “sees” neutrinos. “Ernie” was the highest-energy neutrino ever observed when it was detected. (Image courtesy of IceCube)

Even with cutting-edge technology, catching high-energy neutrinos is tricky. IceCube picks up around 3,000 particle events a second, the vast majority simply the result of cosmic rays. A neutrino shows up about every six minutes, but almost all are low-energy types that don’t merit further investigation.

But a couple of times each month, a neutrino carrying thousands of times the energy makes an appearance. These are the ones IceCube researchers care about, and the shape of the Cherenkov light tells them both the energy of the neutrino and the direction from where it came.

“These are golden events,” Halzen says.

The first two (dubbed “Bert” and “Ernie”) came in May 2010, and over the next two years, IceCube detected 26 more neutrinos of similar energy levels. It continues to spot about 25 “golden events” each year.

The quest continues

UW-Madison researchers have even bigger plans for the coming years.

The IceCube Collaboration is proposing IceCube-Gen2, a detector that’s 10 times larger than the current setup, built in the same location, on top of the existing detector.

The reason?

Since neutrinos travel light years unscathed, scientists believe they may carry information about the events that spawned them. But to begin to unravel the clues, researchers simply need more neutrinos.

“We’re right at the precipice of understanding what’s going on,” says Hanson. “IceCube was a discovery instrument. We’ve discovered our signal, and now we need to go to the next phase to understand what the signal is.”

And others are on the hunt, too, like Professor Albrecht Karle, a German physicist who came to UW-Madison in 1997 to work on IceCube’s pilot project.

Today Karle is searching for even higher-energy neutrinos — ones that are about 100 times more energetic than Bert and Ernie. He is the principal investigator of the Askaryan Radio Array (ARA), another experiment not far from IceCube. ARA measures radio waves emitted when neutrinos collide with a water molecule’s nucleus deep in the ice. Those collisions produce a cascade of electrons — millions of them — that, in turn, creates a radio pulse that can be detected by antennas closer to the surface.

ARA is still very much in the early stages while it awaits additional funding, but the project's aim is to cover an area 100 times larger than IceCube. The team seeks to uncover the number of neutrino events occurring at higher energy levels. The answer could shed light on not only neutrinos and their sources, but the makeup of the highest-energy cosmic rays in our universe.

Back at home in Madison, researchers are testing new approaches to covering cosmic events.

IceCube has now sped up data analysis to the point where researchers can spot an event in real time and alert astronomers, who can use high-powered telescopes to investigate the source.

It's a real-time version of an approach used last year by Assistant Professor of Physics Yang Bai and a team of UW-Madison physicists and astronomers. They analyzed historical data from IceCube and three NASA X-ray telescopes to find evidence that Sagittarius A*, the enormous black hole at the center of the Milky Way, may have produced some of IceCube's high-energy neutrinos.

But, as Halzen notes, "it would be a great surprise if any of these neutrinos came from a steady source."

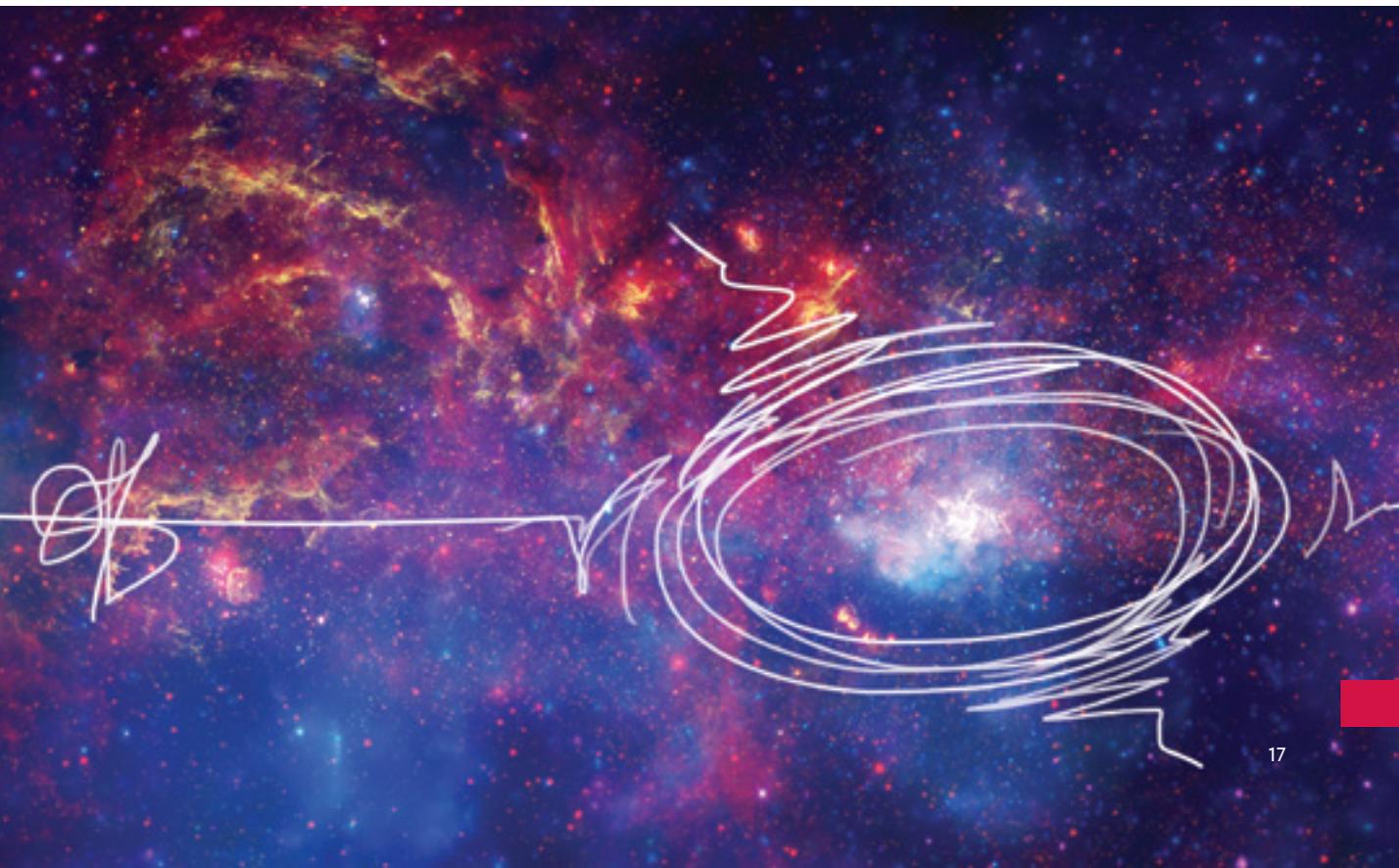
"They are usually things that explode and go 'boom,'" Halzen says. "The best bet now is that they come from sources not in our galaxy, throughout the universe."

Certainty is hard to find in the world of neutrinos. But that's precisely why IceCube researchers keep chasing the ghost particle — the promise that it will reveal new lessons about the universe and spur astrophysics, and science as a whole, forward.

"There are practical aspects to astronomy, such as time keeping," says Hanson. "But that's not where we, as humans, started. It was curiosity. We wanted to know, what are these things that are going on up there? And we started realizing patterns. And this is just the quest. The quest continues."

"IceCube was a shot in the dark," adds Halzen. "If we had never seen anything, nobody would be surprised, including us. It was a total shot in the dark. But that's how science is, right? If it's not a shot in the dark, it's not science." ■

High energy neutrinos may come from black holes such as Sagittarius A*, pictured below. (Image courtesy of NASA - X-ray: NASA/CXC/UMass/D. Wang et al.; Optical: NASA/ESA/STScI/D.Wang et al.; IR: NASA/JPL-Caltech/SSC/S.Stolovy)





Our year
in review

A year of TOP MARKS

Every year, faculty, staff and students in the College of Letters & Science make discoveries, launch pioneering research projects, win prestigious awards, and work to improve the lives of people all across Wisconsin and the world. Here's a look at the past year:



BRYCE RICHTER (8)
SUBMITTED PHOTO (2)

DISTINGUISHED TEACHING AWARDS

L&S faculty members (above, left to right) won
10 of the 12 UW-Madison awards:

- David Baum (botany)
- Karen Britland (English)
- Jill Casid (art history)
- A. Finn Enke (gender and women's studies and history)
- Jonathan Gray (communication arts)
- Jenny Higgins (gender and women's studies)
- Alicia Cerezo Paredes (Spanish and Portuguese)
- Craig Werner (Afro-American studies)
- Eric Wilcots (astronomy)
- Jordan Zweck (English)

\$100 million raised

Last November, UW-Madison alumni John and Tashia Morgridge made the largest single contribution from individual donors in the history of the institution.

Their gift inspired many alumni and friends, who gave an extraordinary \$50 million — \$100 million with the **Morgridge Match** — to fund 57 new or enhanced professorships, chairs, and distinguished chairs and staff positions in the College of Letters & Science.

➔ [Read more on page 41.](#)

28 NEW FACULTY

Among the new faces in the college:
Rising star author **Danielle Evans**, who joined the top-ranked Creative Writing Program.



SARAH MORTON



JEFF MILLER (2)

TOP NATIONAL HONORS

Elected to American Academy of Arts and Sciences: Distinguished Professor of Psychology **Jenny Saffran** (top left), an expert on how infants develop cognitively

Guggenheim Fellows: Vilas Distinguished Achievement Professor of Astronomy **Amy Barger**, John D. MacArthur and Vilas Distinguished Achievement Professor of Mathematics **Jordan Ellenberg**, and Martha Meier Renk-Bascom Professor of Poetry **Lynn Keller**

The Wilderness Society's Robert Marshall Award: Frederick Jackson Turner and Vilas Research Professor of History, Geography and Environmental Studies **William Cronon** (bottom left), an environmental historian

Presidential Green Chemistry Challenge Award: Professor of Chemistry **Shannon Stahl**

Society of Professional Journalists' best student magazine: *Curb Magazine*, produced by students in the School of Journalism and Mass Communication

SCHOLARSHIP WINNERS

Phoenix Rice-Johnson, a junior from Pahoehoe, Hawaii, majoring in political science and international studies, received the **Harry S. Truman Scholarship**. This award provides \$30,000 for graduate education in leadership and public service. Read more about Phoenix and other star L&S students on page 26.

Three L&S undergraduates — junior **William Mulligan** (biochemistry), sophomore **Sohil Shah** (chemistry, mathematics and economics) and junior **Meghan Turner** (biochemistry and mathematics) — won **Barry M. Goldwater Scholarships** for excellence in the sciences.

Scott Memmel (B.A.'15, English and Journalism) received the inaugural **Tom Mulhern Scholarship for Sports Journalism**. The scholarship, in memory of the longtime, widely-respected Wisconsin sportswriter (pictured below left), was created by Mulhern's close friend and fellow alumnus Jason Wilde (B.A.'94, Journalism).



WISCONSIN STATE JOURNAL:
SARAH MORTON



SARAH MORTON

WISCONSIN IDEA

The **Center for the Humanities' Great World Texts program** brought more than 550 students from 18 Wisconsin high schools to UW-Madison for a day of learning and discussion about remarkable literature.

Sydney Burns (left) and Emma Fenrich (right), sophomores at Oshkosh North High School, pose with their project inspired by the Great World Texts program. "This is the most exciting day of my life," said Burns.

Both hope to attend UW-Madison. "It's a childhood dream to go to UW," said Fenrich.



Preparing
students for
success in
life & work

Building the L&S CAREER INITIATIVE

The Letters & Science Career Initiative aims to radically transform career services for our students. Launched in 2014, the goal is to help every L&S student — not just the extra-motivated or well-connected few — chart his or her path to success. Over the past 18 months, we have called upon the strengths of our community — faculty, staff and our enthusiastic and successful alumni — to achieve this goal. Read on to find out what we’ve achieved so far and where we plan to go.

Two Wisconsin companies support the L&S Career Initiative

We are proud to welcome American Family Insurance and Covance Inc. as sponsors of the L&S Career Initiative.

American Family Insurance committed \$400,000 over 10 years to support the Career Kickstart residential program (see below) and enhance the company’s recruitment of talented L&S students.



Covance Inc. will join American Family Insurance in sponsoring the Center for Academic Excellence’s Second-Year Career Conference, a unique event that helps promising students from diverse backgrounds gain valuable career preparation guidance.



New career community opens in Ogg Hall

This fall, we partnered with University Housing to launch the new Career Kickstart program in Ogg Hall.

More than 600 students will live in a one-of-a-kind immersive career residence hall, where they will reflect upon their interests and strengths, connect their academic pursuits to professional goals and discover their place in the world of work. Alumni and employers will hold career workshops, host company site visits and offer tailored mentoring and networking sessions to help students polish their interviewing skills and resumes.



JEFF MILLER

New career course soars to success

The new Inter-LS 210 “Taking Initiative” career course, taught by Professor Greg Downey, debuted last spring. Nearly 250 students met with alumni mentors and career advisors to better articulate their skills and abilities, learn about industry trends, create an academic and career plan, develop LinkedIn strategies, and more.

➔ **Read more on page 22.**

Alumni, friends and parents get involved

Our network of loyal Badger alumni, friends and parents are helping build the L&S Career Initiative.

✓ **18 career advisors and 18 alumni mentors** participated in the new “Taking Initiative” course

One alumni mentor said, “I loved having the opportunity to give back to my alma mater and provide real-life advice about the skills I gained from my education, and now apply to my career.”

✓ **30 new alumni video vignettes** showcase the breadth and depth of careers for liberal arts students and provide meaningful advice for young Badgers preparing for the job market

✓ More than **120 alumni attended special student networking events** last fall and spring in Madison

And there’s more on the way: We aim to involve more alumni, friends and parents to build a network of dedicated volunteers to launch our students higher, sooner.

To learn more and get involved, visit: <http://go.wisc.edu/lsci>

Career preparation ramps up across the college

Departments and programs across the college are joining the L&S Career Initiative to help prepare graduates for success in life and work. Among the innovative programs:

✓ **Political Science:** The “Wisconsin in Washington, D.C.,” program is a competitive year-round internship in the nation’s capital available to undergraduates in any major.

✓ **History:** Two courses, “History at Work: Professional Skills of the Major” and “History Internship Seminar,” help our history majors prepare for a wide variety of careers.

✓ **Criminal Justice Certificate Program:** Students choose from more than 70 internship opportunities and participate in alumni mentoring that equips them to jumpstart their working lives.

Great Lakes grant supports low-income students

A \$150,000 Career Ready Internship Grant from the Great Lakes Higher Education Guaranty Corporation is helping students with financial need reap the benefits of paid internships. The grant established more than 45 paid internships across the country for L&S students.

“When internships are unpaid, students who can’t afford to work for free miss the chance to gain a competitive edge in the job market. This grant will help us provide more paid internship offerings to students with financial needs.”

— John Karl Scholz
Dean and Professor of Economics



BRYCE RICHTER



DYLAN MORIARTY



Preparing
students for
success in
life & work

New career course asks students to **TAKE INITIATIVE**

Ryan Kielczewski had already crossed off the first big item from any college student's to-do list: choosing a major.

It took some doing, too — deciding to scrap veterinary medicine (he decided he didn't love biological science), contemplating business school (he started taking the pre-requisites) and settling on economics (Econ 101 grabbed his attention and the broad applications of the discipline hooked him).

"Economics is so involved in every decision," he said during a break from a full day of classes. "There's opportunity-cost every day in every single thing you do."

But nailing down a career plan? That might be an even trickier challenge.

"Some people do already have it planned out, but, to be honest, I really don't," said Kielczewski.

And that uncertainty is part of the reason Kielczewski enrolled in the College of Letters & Science's new academic- and career-planning course last spring.

L&S created Inter-L&S 210 Taking Initiative, now offered each fall and spring semester, as part of the L&S Career Initiative to help second-year students sift through the wide array of options in front of them — from classes to majors to careers.

As UW-Madison's largest school, L&S offers 65 undergraduate majors and 39 certificates, which afford students plenty of possibilities. Choosing the best fit, though — and tying it to a future career — can be challenging, even for the most driven students.

And, as Professor Greg Downey noted in class, the most popular majors in L&S — biology, economics, political science, psychology, communication arts and history — don't necessarily lend themselves to obvious, ready-made career paths.

Downey's course asks students to assess and reflect on their strengths, and then connect them to classes and majors that will lead to careers that draw on and enhance those strengths. Students conduct informational interviews with professionals, create LinkedIn profiles, and write resumes and cover letters targeted to specific opportunities. Students also have access to alumni mentors who Skype in from across the country to provide insights from their own career journeys.

Tony Carroll (M.A.'80, Public Policy and Administration), a corporate lawyer and business advisor based in the Washington, D.C., area, told one class to make connections and build personal networks through service opportunities and community work.

"Do something that shows you can lead," he advised.



SARAH MORTON

But the idea isn't to simply replicate a job seekers workshop. Downey wants students to find connections between classes and better understand how to draw both abstract, conceptual knowledge and concrete, pragmatic skills out of their liberal arts educations, regardless of their majors.

Each assignment, reading and lecture ties into the course's core themes of critical reflection and narration, which guide the students as they shape their personal brands. At the end of the semester, they develop two-minute elevator speeches that articulate those brands.

"One thing we're trying to do is give students a scheme, a language and a set of tools for talking about what they've done in the past, what they want to do in the future, what they think they can bring to an organization, and to be able to really communicate that," Downey said. "They're going to have to tell and constantly re-tell this story about themselves, to themselves throughout their careers."

Kielczewski was still in the early stages of writing his story while in the course, wondering if he could use his economics training in a political setting. Inter-L&S 210 was the right course for that sort of exploratory thinking.

"Everything's so job-related these days. Everything's just leading up to the job and how to get one, and it's so hard," he said. "So why not take a class like that?"

CHOOSING A MAJOR

Fresh advice from Professor Greg Downey

- ▶ Change your way of thinking from a "major" to a "mission." What do you want to do in the world?
- ▶ Think less about a "department" and more about a "way of knowing." How do experts in that discipline ask questions about the world? How do they analyze information?
- ▶ Don't rely on websites and introductory courses. Talk to faculty and staff, attend a public lecture and ask an advisor.
- ▶ Take a risk! Where else can you try something new with expert guidance, a peer community and clear next steps?
- ▶ 10,000 hours. Turning strengths to talents takes work. Don't feel bad when it's hard!



JEFF MILLER

85%

Of students who took the course are now more confident exploring career options.

"I am now more confident in my education and I feel I have more confidence in my career path. This confidence will make me more successful in the future and will make me more marketable."

— said one L&S student after the "Taking Initiative" course



Supporting
outstanding
students

Learning about the brain: **MEET “THE NEURO KIDS”**

One of the hottest majors in the College of Letters & Science might involve a few sore fingers. Just watch Matt Stachowski as he plunges one hand into an aquarium, where a bright red crayfish scuttles backwards.

“He’s going to pinch you,” someone warns.

“No, I’m grabbing where he can’t reach me,” says Stachowski, nabbing the crayfish from behind. But the scarlet critter writhes free, dropping back with a splash.

The opportunity to learn how the brain’s nerve cells are born, grow and connect makes slippery moments like this one worthwhile for juniors and seniors like Stachowski who want to study neuroscience.

Fueled by President Obama’s \$300 million BRAIN Initiative, which supports innovative research around emerging neurotechnologies, this rapidly expanding field is drawing students from many disciplines, including mathematics, physics, computer science, psychology, engineering, and medicine.

The demand for the “neurobiology option” offered as part of the biology major has skyrocketed since it was first offered in 2005. Averaging close to 300 students enrolled each year, the program is currently beyond capacity, with undergraduates lining up to get into neurobiology labs added last spring and taught by zoology Professor Tony Stretton, neuroscience Professor Peter Lipton and neurology Professor Corinna Burger.

A new proposal, approved last spring, will help meet this demand by launching a neurobiology major in the Department of Zoology in fall 2016.

“An official major will finally put this program on sound footing and make it sustainable for the future,” says Lipton. “Students would rather have a major than an option. It enables them to do more neuroscience, and makes them more relevant to employers, graduate schools and medical schools.”

“These students know they have been part of a pioneering neuroscience effort on campus,” he adds. “They call themselves ‘the neuro kids.’”

After capturing their crayfish, “the neuro kids” in Stretton’s lab plunge the skittish research subjects into coolers of crushed ice and turn their attention to the blackboard. Today they are measuring lambda, or how fast a signal decays along a cell membrane — a fundamental step in studying neurons and their behavior.

What they’re really learning is how to conduct experiments, which Stretton says “requires a different intelligence.”



SARAH MORTON (2)

A group of undergraduate students works with crayfish in Professor Tony Stretton’s neurobiology lab. Studying crayfish allows them to observe how signals move along neural pathways.



“This lab is a critical step from learning about science, to actually doing science,” says Stretton. “Science is based on experiments. To do experiments you have to learn the relevant techniques, if they exist, or devise new ones, if they do not. They will develop competence and confidence.”

By the end of the course, they will have progressed from carrying out specified experiments to devising an original short project on their own. That’s the essence of the scientific laboratory method, and adding more labs like this one will make UW-Madison a stand-out choice for many potential neuroscience majors.

Brain scientists are achieving remarkable breakthroughs in areas as diverse as obesity, stroke, dementia, Parkinson’s, epilepsy, and many more challenging disease studies. Today, for these undergraduate students, it’s crayfish. In ten years, it may be a cure for Alzheimer’s.



THE BRAIN TODAY

Advances in imaging technology allow us to study what’s happening in the brain at any moment, during any activity, from meditation to athletics to eating and drinking.

Understanding the function of the brain’s 10 billion working parts and the relationships between brain systems and the body is one of the most daunting and exciting challenges of our time. Physicists, computer scientists, biologists, engineers, psychologists, doctors, and many others are focusing their expertise on the brain.

No wonder UW-Madison students are excited to study the brain through the lens of neuroscience!



Supporting
outstanding
students

A look at **OUR GREAT STUDENTS**

L&S scholarships are awarded on the basis of need and merit to students college-wide, with many more granted by our departments and programs. Most awards vary from \$500 to \$3,000, but a handful of individuals and corporate donors have established scholarships as large as \$8,000 to help families cover the cost of a UW-Madison education.

Perspectives on history: Great People Scholar Islam Aly

Many people might watch the movie *300: Rise of an Empire* and cheer for the Greeks — who are portrayed as noble underdogs. But freshman Islam Aly sees another side to the story.

“If you read the Persian accounts of that conflict, you would learn something very different,” he says. “History is in the eye of the person telling it.”

Aly, who received a Great People Scholarship from the College of Letters & Science this spring, always liked history, and during sophomore year, at Madison Memorial High School, his mild interest flared into a full-blown passion. The teacher: Tom Kellogg. The class: AP World History.

“Mr. Kellogg urged us to consider a whole range of sources. We had to drill for the facts and take the biases of the storytellers into account,” Aly says. “I just soaked it up. After that class, I knew history was going to be my path.”

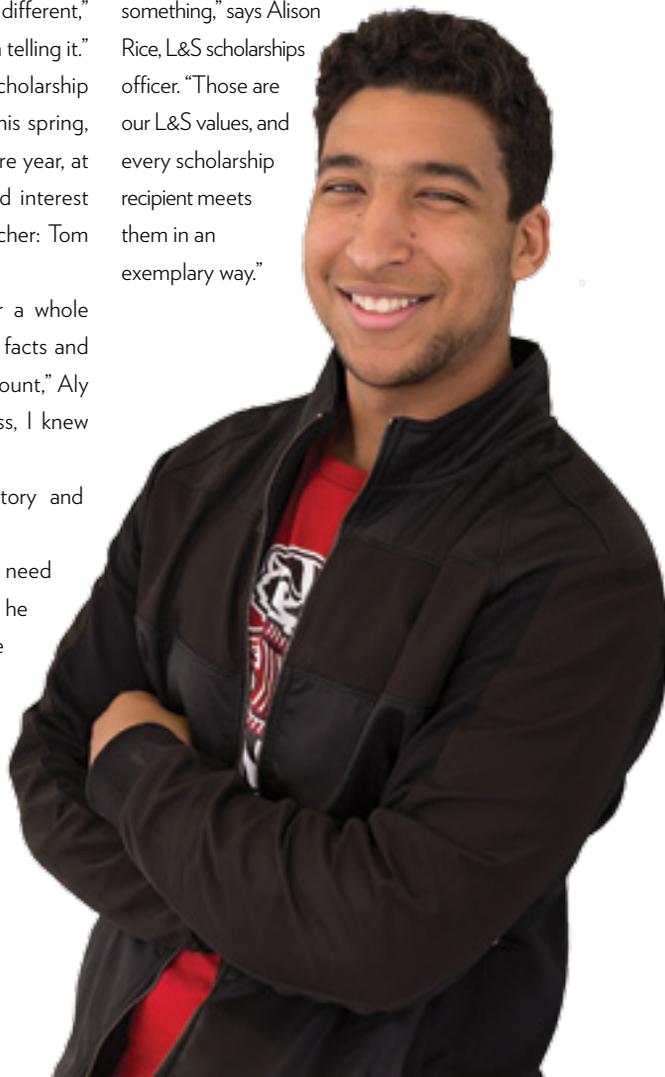
Aly plans to double major in history and economics at UW-Madison.

“To get a real sense of history you need a strong background in economics,” he says. “I like economics because there isn’t just one explanation. It’s very analytical, it’s up to us to weigh several explanations and pick the best one.”

The L&S scholarship committee looks further than students’ list of accomplishments when making awards.

“We are looking for students who are curious about the world, keen to make a difference, and in tune with why they are interested in something,” says Alison

Rice, L&S scholarships officer. “Those are our L&S values, and every scholarship recipient meets them in an exemplary way.”



AT A GLANCE:

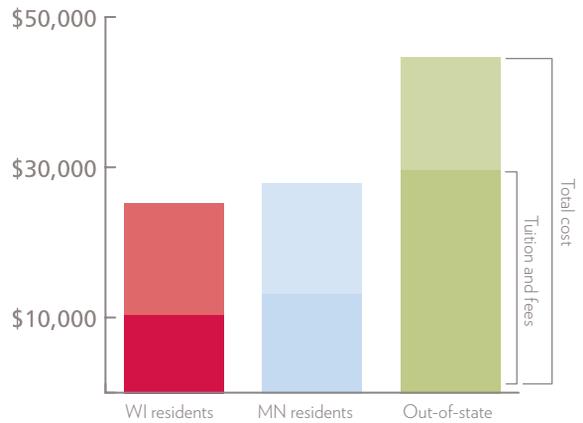
Cost of attending UW-Madison

TUITION AND FEES

- ▶ \$10,399 for Wisconsin residents
- ▶ \$13,185 for Minnesota residents
- ▶ \$29,650 for non-residents

TOTAL COST (PER YEAR)

- ▶ \$24,719 for Wisconsin residents
- ▶ \$27,845 for Minnesota residents
- ▶ \$44,570 for non-residents



The beauty of math: Math Talent Search winner Thomas Hameister

Every year, from middle school onward, Thomas Hameister signed up to compete in the Math Talent Search sponsored by UW Madison’s Mathematics Department. Every year, he seemed to get a little better at solving the complex problem sets. But he was still bowled over when, as a high school senior, his name was called at the annual Honors Day Ceremony in Van Vleck Hall on the UW campus. Hameister had topped the list of the 26 highest-scoring participants—and become the 50th winner of the annual Math Talent Search competition, netting a \$24,000 scholarship to UW-Madison.

“It was very, very good news,” says Hameister, who recently completed his first year as a math major. “I believe that the more exposure you get to stuff that’s over your head, the better you become.”

That’s the idea behind the Math Talent Search, according to Assistant Professor of Math Melanie Matchett Wood, who helps coordinate the contest. She says the professors who write the five sets of proof problems know that middle- and high-school students won’t necessarily know how to do them right away.

“We ask them to use the skills they have, but think in a new way,” she says. “The Talent Search is not just

about finding the right answer, but about the reasoning process the students go through to find the solution.”

Math Talent Search is intended to engage and encourage students in math, and has identified Wisconsin students who have gone on to become mathematicians or found careers in finance, computer science, and statistics.

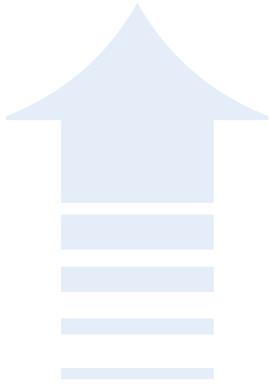
This year, Hameister worked as an Undergraduate Research Scholar with Professor Gloria Mari Beffa, chair of the Mathematics Department. The experience allowed him to see what an academic career might look like.

“I appreciate that math is more than a set of skills you apply to things,” he says. “It gives you a better understanding of the way things are. Math makes you think.”





Supporting
outstanding
students



We are committed to our students...

Thanks to donors, we award more than **290 scholarships totaling \$1.07 million** each year. This is a 44% increase in scholarship aid in just four years.

Finding a new home: Herfurth Scholar Samantha Solberg

Samantha Solberg grew up on her family's dairy farm in Athens, Wis., a village of a little more than 1,000 people about 20 miles northwest of Wausau. She spent winter nights throwing down hay for the herd of two dozen Holsteins and summer days helping her dad prepare for field work.

So it took some adjusting when she arrived at UW-Madison in 2013.

"It was quite different," she says, recalling the tear-filled move. "I hadn't really been away from my parents at all, and then just going to this big city."

She's since settled in. Solberg, a junior majoring in mathematics and statistics, is planning to attend graduate school with an eye on a career in corporate research or data analysis. But it was her Norwegian classes that helped ease her transition from a small, rural high school to a massive, bustling university.

"It felt like basically just a small class where we got to know each other," says Solberg, who enjoyed learning about the language and the culture so much that she decided to add a certificate in Scandinavian studies.

Solberg received a \$3,000 Theodore Herfurth Scholarship from L&S last year and has also benefited from two Great

People Scholarships. She says she wouldn't have been able to attend UW-Madison without financial aid, including those need-based scholarships.

Because of that support, she's now in a position to help other young Badgers adapt to college life: She's working as a housefellow in Kronshage Hall.

"Now I love it in Madison," she says.



...But we have more to do

Only 25% of our students with financial need receive scholarships. Help us support outstanding students.

Give now: go.wisc.edu/scholarships

Empowering the world: Troxell and Truman winner Phoenix Rice-Johnson

Phoenix Rice-Johnson remembers growing up in Hawaii without some of the everyday amenities many of us take for granted.

“My dad raised me on a mechanic’s income,” she says. “I was accustomed to poverty and unemployment in my household, because it existed throughout my community. I began thinking about a career in public service to help overcome these kinds of inequalities.”

Rice-Johnson, a senior, has come a long way from relative poverty in Hawaii, to the campus of UW-Madison, where she has excelled as a political science and international studies major and an activist and leader.

In spring 2015 Rice-Johnson was one of two UW-Madison students selected to receive the prestigious 2015 Truman Scholarship, awarded to 58 students nationwide. She also received the Louise Troxell Award, given to an outstanding L&S female student whose qualifications include intellectual ability and curiosity, good citizenship, appreciation of the world outside herself and interest in participating in its affairs.

That fits Rice-Johnson, whose goal is to work as an advocacy lawyer to “foster a more democratic and civically-engaged country.”

Right now she’s focused on doing that here in the United States, but Rice-Johnson does not rule out an international career.

“I spent a semester abroad in India living with a widow named Madhu,” she says. “I saw the limitations of her life — she was not allowed to leave the house without her son’s permission — and I began researching ways to increase women’s access to governmental representation in developing countries.”



SARAH MORTON:
SUBMITTED PHOTO



Advancing
research &
knowledge

In their own words: **FUELING DISCOVERY**

Two professors describe their exciting, world-changing research

Infants give strong clues to language learning

Jenny Saffran, Distinguished Professor, Department of Psychology and Director, Infant Learning Lab



JEFF MILLER (2)

Imagine that you've been dropped into an unfamiliar country. People are speaking all around you. But you don't recognize the sounds or objects surrounding you. You don't even hear words; all the sounds are

mushed together. It is very confusing.

This is the infant's world. And yet, to babies, this situation doesn't appear to be confusing in the least. How do they make sense of it all?

As any parent can tell you, most infants begin to understand language long before they can produce words themselves. In the Infant Learning Lab, my students and I aim to discover how infants learn to understand.

Each year, more than 1,000 Dane County infants visit our lab at the Waisman Center. They

don't have to say a word! We are able to measure what they know by tracking their eye gaze while they view pictures on a screen, or by timing how long they listen to familiar sounds.

Using these simple methods, we have learned a great deal about how infants come to understand their native language (or languages). Infants are remarkably good at detecting patterns of sounds, allowing them to figure out where words begin and end. They are also highly skilled at mapping these sounds onto meanings, which is the basis of learning words, and at discovering patterns of words that form sentences.

Not all infants are equally skilled at language learning. For infants with developmental disabilities, the linguistic world may be particularly confusing. By working with infants of diverse abilities, we hope to better understand both how language learning typically unfolds, and how to help infants for whom learning is especially challenging.



Jenny Saffran, at right, talks with mother Rebecca Cuninghame and her daughter, Arella Wedell-Cuninghame, at the Infant Learning Lab.



DISCOVER MORE

In spring 2015, the college partnered with the *Wisconsin State Journal* to publish a special section showcasing how L&S truly fuels discovery.

The 32-page section features essays, like these printed here, written by faculty members from across the college.

Read more stories of discovery at

go.wisc.edu/lstdiscovery

Bacteria talk to each other, and we're listening

Helen Blackwell, Professor, Department of Chemistry and 2013 Wisconsin Alumni Research Foundation Innovation Award recipient



BRYCE RICHTER

Bacteria are some of the simplest, tiniest organisms on Earth. They have short life spans and are, well, small — so their individual impacts on our world are seemingly minimal. Or so I thought.

I was amazed to learn about the ability of bacteria to work together as a collective group, to undertake actions that would be impossible as a singular cell. And, to unite as this community, they had to somehow determine that they had assembled sufficient cells in a given environment to, for example, attack an animal host and cause a life-threatening infection. Or to invade a plant and initiate a mutually beneficial relationship.

I learned that many bacteria use simple chemical signals to count themselves. As a chemist, I was fascinated. Could I make these signals in my lab? Could I alter these signals — making synthetic molecular “icebreakers” — so as to cause the bacteria to have different conversations?

As many human pathogens use this cell-cell language, called quorum sensing, to initiate infection, I figured that my compounds could have

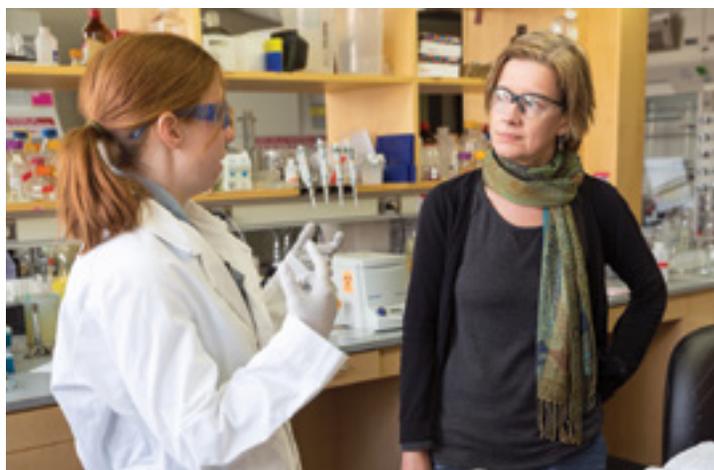
value as alternate antimicrobial drugs. Or, they could constitute a probiotic approach — forcing bacteria to do good things for their hosts.

My research group has been able to tinker with these signals and generate potent conversation blockers in bacteria.

We are using them to explore the basic mechanisms of bacterial communication and decipher their role in the microbial world, and thereby, our human world.

These tiny organisms have much to tell us. I'm listening.

Professor of Chemistry Helen Blackwell (right) discusses results with Kim Tyler, a graduate student researcher, in her lab.



SARAH MORTON



Advancing
research &
knowledge

FUTURE-PROOFING the **INTERNET**

In our daily lives, we're surrounded by countless systems we typically take for granted. We expect lights to go on with the flick of a switch, and clean drinking water to flow with the twist of a faucet. And in the 21st century, we expect Internet access to be fast, reliable and always ready at the click of a mouse or swipe of a touchscreen.

These systems are the background of our lives, and most of us think about their operation only when something goes wrong. No news is good news, as they say — and an outage or persistent performance problem is bad news that can affect a large number of people and businesses.

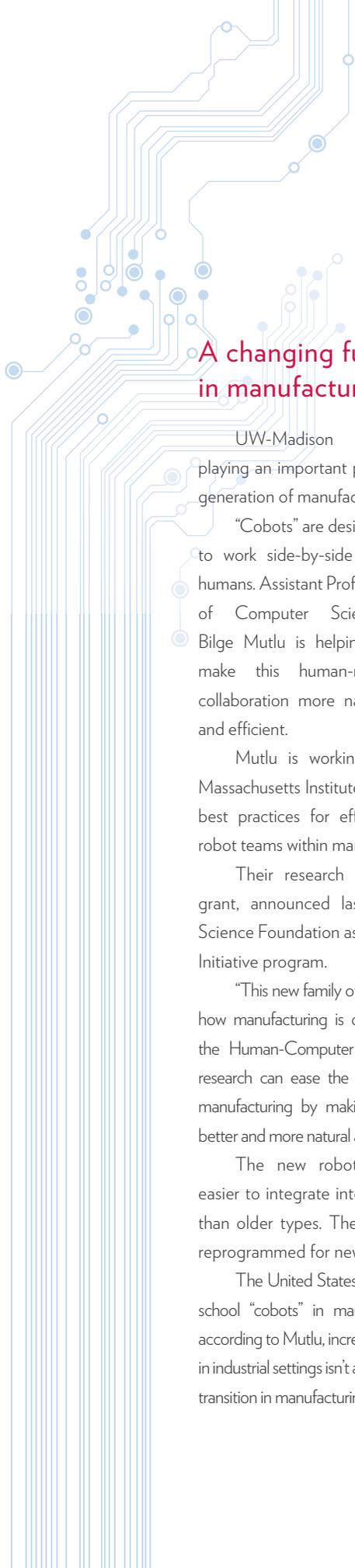
Aditya Akella, an associate professor of computer sciences, is determined to reduce network

failures and performance issues. Many of the key technologies he has invented operate within the core internals of network hardware and software, keeping them happy and humming. His work may be somewhat opaque to the average Internet user, but its impact is far-reaching.

One of Akella's top goals is making networks "future-proof." And it's a tall order in a rapidly



ANDY MANIS



A changing future in manufacturing

changing tech environment marked by a profusion of devices and computing that is embedded into almost every facet of life.

“I want to make networks perform well and be robust, even as new, disruptive technologies arise, including both hardware and software,” says Akella.

Akella credits UW-Madison’s collaborative environment as a major factor in his success. “Being at UW has been a great asset,” he says. “I couldn’t replicate this work anywhere else.”

Modeling network complexity is one of Akella’s key innovations. Complexity is what makes networks failure-prone, he says. By analyzing what makes them problematic, robustness can be improved. To that end, Akella developed the first complexity metrics for network design, helping to pinpoint the likelihood of a particular network’s failure and what factors might contribute to a breakdown.

Akella’s strategies help not only with improving user-perceived performance, but also with energy and battery constraints and bandwidth costs. A redundancy-elimination system he developed called EndRE is part of Microsoft’s Windows 8 operating system. Other systems he’s developed have been adopted by Dell, and some are under trial for adoption at the Bay Area startup Instart Logic.

Akella is the co-principal investigator of the National Science Foundation-funded CloudLab project, which will explore future cloud architectures and also support high-level research in numerous disciplines.

“We are unique here,” he says, citing UW-Madison strengths in systems, networking and cloud computing. “We lead the world in large infrastructure research and education.”

— Jennifer A. Smith,
Department of Computer Sciences

UW-Madison computer scientists are playing an important part in enhancing the newest generation of manufacturing robots.

“Cobots” are designed to work side-by-side with humans. Assistant Professor of Computer Sciences Bilge Mutlu is helping to make this human-robot collaboration more natural and efficient.



PERRY KIVOLOWITZ

Mutlu is working with counterparts at the Massachusetts Institute of Technology to determine best practices for effectively integrating human-robot teams within manufacturing environments.

Their research is funded by a three-year grant, announced last year, from the National Science Foundation as part of its National Robotics Initiative program.

“This new family of robotic technology will change how manufacturing is done,” says Mutlu, who directs the Human-Computer Interaction Laboratory. “New research can ease the transition of these robots into manufacturing by making human-robot collaboration better and more natural as they work together.”

The new robots are less expensive and easier to integrate into the manufacturing process than older types. They are also capable of being reprogrammed for new tasks.

The United States is still in the early days of new-school “cobots” in manufacturing environments. But according to Mutlu, increased human-robot cooperation in industrial settings isn’t a question of “if” or “when” — the transition in manufacturing has already begun.



Reflections on a distinguished career: **A FIGURE OF SPEECH**

Donald Downs was years away from establishing himself as one of the country's top free speech scholars and advocates, but he still knew a First Amendment problem when he heard one — and he wasn't afraid to share his opinion, even during a job interview.

During dinner at Otto's on Madison's west side the night before he was to formally interview for a faculty position at the University of Wisconsin-Madison in 1984, Downs was aghast when representatives of the Department of Political Science made a confession: An upcoming campus lecture had been canceled under the threat of student dissent ... and the professors hadn't put up a fight.

"I got mad," Downs recalls. "I said, 'You don't have a university if that kind of thing happens.' This is a major figure and she can't come here for a talk? I was amazed."

Downs brought that kind of verve to UW-Madison throughout his 30 years on campus. He retired in May, having built a reputation as a fierce defender of free speech and academic freedom, an acclaimed constitutional law scholar and an award-winning teacher who challenged students to consider all sides of an issue.

Former students attribute Downs' popularity to a charismatic teaching style that welcomed — demanded, really — discussion and debate in any setting, from large undergraduate lecture hall to small graduate seminar.

"It was in his class that I learned why we're here as students. He taught us that university inherently means unity in diversity of ideology," says political science alumnus Lee Hawkins, who studied under Downs in the 1990s and is now a reporter for the *Wall Street Journal*.

"It wasn't debate just for the sake of debate, but it was debate for the sake of mutual understanding and resolution of important issues that we were discussing in class."

Downs taught, researched and wrote about some of our society's fundamental issues, contentious topics such as free speech, civil liberties and crime and punishment. In courses such as The First Amendment and Criminal Law and Justice, he asked thousands of students to question their preconceived notions about polarizing topics and to consider alternative, even off-the-wall opinions — "to challenge every way that you viewed anything," says Cristina Daglas (B.A.'06, Journalism), now a senior editor at *ESPN The Magazine*.

And, sometimes, that involved exploring provocative ideas — the intersection of hate speech and First Amendment protection, for instance — that might unsettle some students. The key to successfully navigating those discussions, Downs says, is "creating the groundwork that then creates an environment that's conducive to pushing the envelope."

At the same time, Downs was an ardent believer in intellectual honesty, which led him to champion the cause of academic freedom on campus, even when it meant clashing with university administrators, fellow faculty members or students. (UW-Madison, it should be noted, has a long history of supporting academic freedom, going back to the UW Board of Regents' famous "sifting and winnowing" statement in support of political economy Professor Richard T. Ely in 1894.)

Downs spoke out against the UW System's student speech code in the early 90s and, along with a group of passionate students and faculty members, played a leading role in abolishing UW-



SARAH MORTON

Madison's faculty speech code in 1999. He calls the latter, an effort that cast national media attention on Madison, the most memorable accomplishment of his career at UW-Madison.

"He was such a great example of somebody who was principled, who displayed courage in advocating for his convictions," says Jason Shepard (B.S.'99, Journalism and Political Science; M.A.'06, Ph.D.'09, Journalism), who was a student representative on the university committee that recommended abolition of the faculty speech code. "He was strategic, he was thoughtful, he was passionate."

Downs' views on free speech evolved over the years, and he credits influential students such as Hawkins, Shepard, former Wisconsin Deputy Attorney General Kevin St. John (B.S.'97, History and Political Science), and many others for accelerating his shift to a more staunch free speech libertarian viewpoint. (Hawkins, in turn, credits Downs for teaching him the "intellectual humility" to change his own opinions.)

Those bonds, formed in classrooms across campus, during office hours in North Hall or at

informal gatherings at Memorial Union, have forged enduring friendships.

Hawkins flew into Madison a day early in April to sit in on a criminal law seminar. A few weeks later, Downs was in Chicago catching up with a group of former graduate students, including Loyola Marymount political science and law Professor Evan Gerstmann (M.A.'92, Ph.D.'96, Political Science).

"When you form that kind of lifelong bond with your students," says Gerstmann, "that really says something."

Have a memory of Professor Downs to share?

Visit go.wisc.edu/dondowns to read notes and share your own.





L&S and the
Wisconsin
Idea

MAJOR horsepower, major HEARING LOSS

Thunder rumbled over the grandstands at last summer’s annual Budweiser Dairyland Super National Truck and Tractor Pull (aka the Tomah Tractor Pull), but the deafening roar of turbo-charged, 3,000-horsepower machines easily drowned it out. As the ground shook with noise, five University of Wisconsin-Madison audiology students and two professors saw their supply of 2,000 complimentary earplugs vanish faster than cheese curds at the snack tent.

“When people learned we were giving out free earplugs, they were very excited,” says Clinical Associate Professor of Audiology Melanie Buhr-Lawler, who led the first-ever hearing conservation outreach project, funded by a Statewide Outreach Incentive grant, at the event last June. “A tractor pull is one of the loudest places on earth – as loud as a jet plane at takeoff. If you attended the entire four-day event, you would be at significant risk for hearing loss.”

Buhr-Lawler and her colleague, Clinical Associate Professor Amy Kroll, work in the Department of

Communication Sciences and Disorders, a nationally-acclaimed program where faculty prepare graduate students for clinical careers in speech pathology and audiology through outreach in Wisconsin and beyond. Buhr-Lawler focuses on what she calls an “under-the-radar” problem: rural noise.

While many people think of the country as quiet, hearing loss is a major problem for farmers and others who live, work, and recreate in rural areas, according to the National Institute of Occupational Safety and Health (NIOSH). Studies have revealed substantial hearing impairment in most rural residents over age 40.

On a farm, tractors, combines, grain dryers, chainsaws, and woodshops can, individually, exceed 100 decibels or higher—enough to cause permanent hearing damage after 15 minutes of exposure. But, although farming ranks among the top three occupations with the highest risk for hearing loss, farmers are not regulated by the Occupational Safety & Health Administration like workers in similarly noisy urban work environments.

That’s why Buhr-Lawler and her students visit the Tomah Tractor Pull each June with free earplugs and a message: “Major horsepower can cause major hearing loss!”

Many of the pull’s attendees will go home to work with noisy machinery on farms, in machine shops, or in other settings, says Lawler.



SARAH MORTON (2)

Buhr-Lawler says it’s especially important to protect children’s hearing in noisy settings.



UW-Madison Associate Professor of Audiology Melanie Buhr-Lawler with her father, R. Paul Buhr, at their family dairy farm in Viroqua, Wis.

“We want to do two things: provide immediate assistance to protect hearing at the event, and send people home with some good information that will have a lasting impact,” she says.

Growing up on a dairy farm in Viroqua, Wis., Buhr-Lawler heard her dad’s tractors and other loud equipment every day. Heading to the Tomah Tractor Pull was actually her dad’s idea.

“My dad said it’s a great place to find the people who need this information the most, all in one place,” she says.

Buhr-Lawler and her team took some noise readings at the “light class” event and recorded 109 decibels, well over the limit for safe exposure. The “heavy class” events, featuring super semis and modified tractors, are much louder.

“People who work with farm machinery or other kinds of machinery also tend to recreate in settings that put their hearing at risk, such as hunting and tractor pulls,” Buhr-Lawler says. “We want to make

sure they have all the information they need to protect something they might not fully appreciate until it’s gone—their hearing.”

LISTEN IN

A tractor pull is one of the loudest places on earth.

Hear for yourself how Professor Buhr-Lawler addresses ways to combat the effects of rural noise.

go.wisc.edu/tractorpull





A new campus jewel: **THE HAMEL MUSIC CENTER**

Dreams for a new School of Music performance center moved closer to reality this year, thanks to generous gifts from loyal alumni and supporters. Groundbreaking for the new Hamel Music Center is set to begin in fall 2016, with doors expected to open two years later. The new facility will be named for School of Music Board of Advisors member Pamela Hamel and her husband George Hamel (B.A.'80, Communication Arts), who made a lead contribution to the \$56 million project.

The new facility will anchor a highly-visible corner of campus in the university's East Campus Gateway that includes the now-completed Chazen Museum of Art expansion.

"Music has always had an important place in our family," says Pamela Hamel. "We feel privileged to be able to provide the university's music students and fellow lovers of music a world-class facility in which to learn, practice, perform and enjoy music. It's exciting for George and me to imagine just how many students will be able to benefit from and delight in the Music Center for years to come."

The project will include an 800-seat concert hall, a 325-seat recital hall, a large rehearsal room, and state-of-the-art audio-visual capabilities.

Features such as a glass-walled lobby, clerestory windows in the recital hall and a dramatic glassed-in corner of the rehearsal hall will usher in light and allow passersby to see the ongoing rehearsals.

Within the Hamel Music Center, the Collins Recital Hall is named for Paul J. Collins, (BBA'58) another UW-Madison alumnus whose support was critical to the new space. Collins has also



Concept art for the exterior of the new Hamel Music Center. The building is designed by Holzman Moss Bottino Architects of New York City, in partnership with Strang Architects of Madison. Acoustic design is by Richard Talaske/Sound Thinking of Oak Park, Illinois, with theatrical design by Fisher Dachs Associates of New York City.

endowed fellowships and professorships within the School of Music.

“I believe that music is essential for the human spirit, which is why I have supported the School of Music for nearly two decades,” says Collins.

In addition to Collins Recital Hall, the 800-seat concert hall and back-of-house support spaces are possible thanks to generous gifts from soon-to-be-announced donors. The Collins Recital Hall and the concert hall will allow for live-stream concerts and high-quality recordings, and both will be in near-constant use, according to Susan C. Cook, director of the School of Music.

“These are spaces where our undergraduates will perform their capstone projects, where our graduate students will do their final doctoral recitals, and where we’ll hold chamber recitals, lecture recitals, and public events,” she says. “This music center is an incredible gift to our students.”

L&S Dean Karl Scholz, who has long felt that UW-Madison music students and faculty deserve a space worthy of their talents, agrees.

“The Hamel Music Center will be a campus jewel, highly visible and accessible to all,” he says.

THANK YOU!

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NATHAN JANDL

Borghesi family gift boosts humanities workshop series

What’s in a conversation? Varying points of view, great ideas, and so much more.

In the Borghesi-Mellon Workshop Series, humanities scholars (and some scientists, too) explore the stimulating and productive nature of conversations across disciplines. Now in their 15th year, the workshops have led to conferences, books, and teaching innovations.

This year, Nancy Borghesi (B.A.’69, Economics), a member of the College of Letters & Science Board of Visitors, and her husband David Borghesi (BBA’70, Accounting) provided the matching support for a 2:1 grant from the Andrew W. Mellon Foundation, to establish the Borghesi-Mellon Workshop Fund. The fund, administered through the Center for the Humanities, will support the workshop series in perpetuity.

Graduate students and faculty submit proposals for these year-long “conversations” (which include panels and symposia) on topics as diverse as how we view disability in society, to what constitutes a “good” childhood.

“A plurality of methods, questions, fields, and objectives is at the heart of a major research university,”

says Sara Guyer (right), director of the Center for the Humanities. “The Borghesi gift will allow us to foster meaningful collaborations across these differences, opening up new directions for research in the humanities.”



BRUCE RICHTER



COLLEGE of LETTERS & SCIENCE

UNIVERSITY OF WISCONSIN - MADISON

From the 2014–2015 UW-Madison Data Digest and other sources

By the numbers

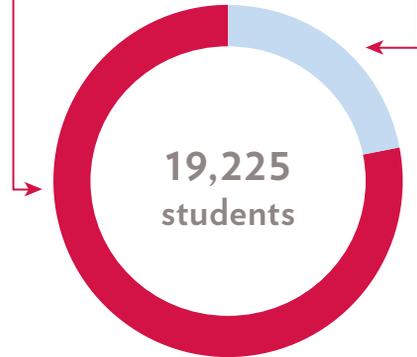
Top **5** majors at UW-Madison — all in L&S

- Economics
- Biology*
- Political Science
- Psychology
- Communication Arts

**Biology major is shared with the College of Agricultural and Life Sciences*

L&S STUDENT SNAPSHOT

Undergraduates	14,994
Graduate students	4,231
Total:	19,225



More than **200,000** alumni

Our students hail from

all **72** of Wisconsin's counties

all **50** states including Washington, D.C.

and **79** countries of the world!



More than half of our students are from Wisconsin
36% are from other states
11% are from other countries

20% of L&S students are first generation college students

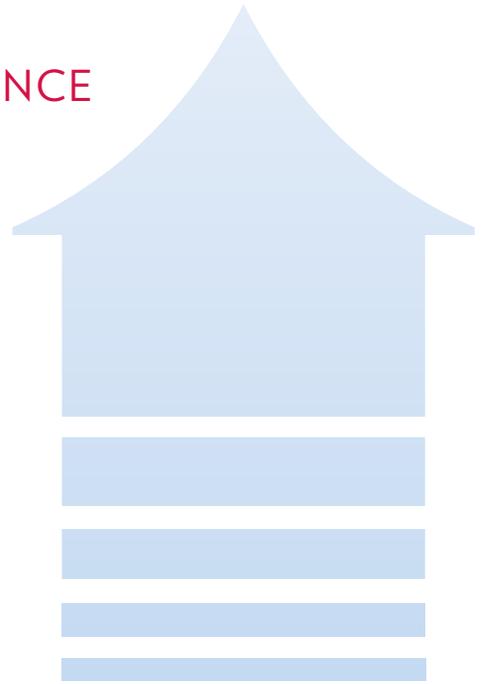
PHILANTHROPY MAKES A DIFFERENCE

As the university embarks on a comprehensive fundraising campaign this fall, the College of Letters & Science has already raised an extraordinary **\$100 million for faculty and staff support**.

This support – made possible by a landmark matching gift from alumni John and Tashia Morgridge – will fund **44 new and 13 enhanced professorships, chairs and distinguished chairs in the College of Letters & Science**.

“I am humbled and inspired by the impact our alumni and friends are making early in this campaign. These investments provide critical support and are a profound honor for our faculty and staff as they pursue scholarship and research at this extraordinary institution.”

— John Karl Scholz
Dean and Professor of Economics



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L&S provides life-changing learning experiences, extends the boundaries of knowledge, and enhances our understanding of the human condition to improve lives in our community and the world.

OUR PRIORITIES ARE:

-  Invest in excellent faculty
-  Prepare students for success in life and work
-  Support outstanding undergraduate and graduate students

2014 GIFTS TO L&S

TOTAL GIFTS

➤ \$48,428,340

TOTAL DONORS

➤ 11,906

FIRST TIME DONORS

➤ 1,627

THANK YOU!

OUR RESEARCH EMINENCE

- ★ **\$129 million** in extramural research awards
- ★ **\$105.4 million** in federal research awards
- ★ **\$134.6 million** in total research expenditures

UW-Madison has ranked among the top five universities in the country for research expenditures for more than 20 years.

OUR HIGH-IMPACT EDUCATION

- ★ **1,167** students enrolled in First Year Interest Groups (FIGs)
- ★ **199** L&S courses were offered through the FIGs program.
- ★ **2,305** L&S students took an honors course



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